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Houghton Mifflin Mathematics 6 Teacher's Resource Book

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Houghton Mifflin Canada Limited

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Houghton Mifflin Mathematics

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Introduction

Development

Houghton Mifflin Mathematics is developed in six strands: **Numeration, Arithmetic, Geometry, Measurement, Graphing** and **Problem Solving**. The first five strands are treated in a *block* approach. Fourteen 24-page units are devoted to the strands. This allows for continuity and easier reinforcement and retention of mathematical skills. Problem Solving is an integral part of the entire program and is treated within all of the five other strands. (See *Problem Solving*.)

A typical unit of *Houghton Mifflin Mathematics* contains ten lessons, each on a two-page layout. Each lesson treats only one objective. The objectives are numbered by a computer code to allow easy tracking of skills for reinforcement and remediation. (See *Learning Objectives*, Page T13.) This approach provides learning in “bite-sized bits” to ensure students master the objective before proceeding to the next level of difficulty.

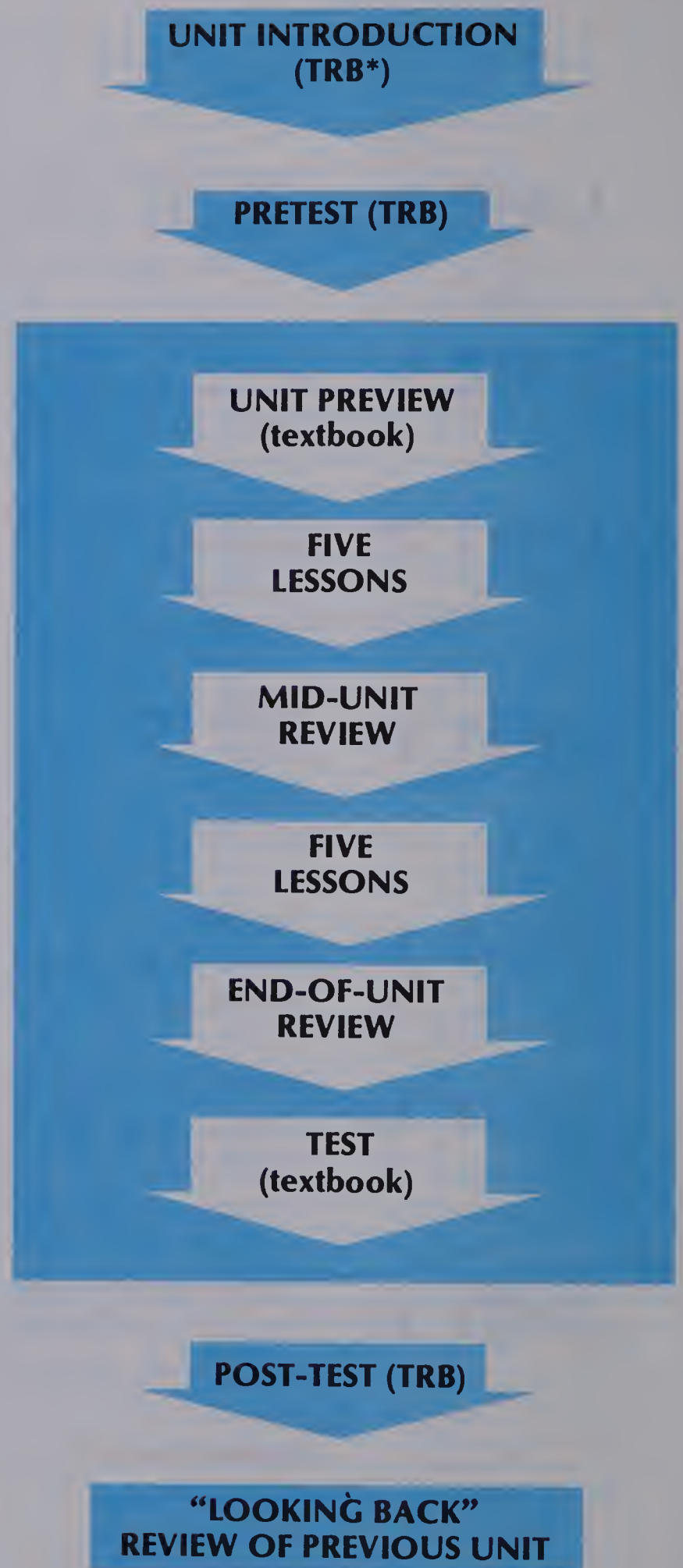
Organization

A typical unit of *Houghton Mifflin Mathematics* follows the sequence shown in the flow chart.

The Introduction in the TRB (Teacher’s Resource Book) will give some mathematical and pedagogical background to the unit. As well, the *Ideas* section provides some useful suggestions for integrating the theme and/or other subject areas with the mathematical content of the unit.

The “Preview” is simply a practice page that reviews some prerequisite skill that will be needed for success in the core lessons of the unit. The lessons are organized in two sections with a mini-review after each section. The “Looking Back” page provides practice in the main strand of the previous unit.

A typical unit will take about three weeks including introductory activities, lessons, reviews, and tests. This allows one day for most lessons. It may be suggested that more time be spent on certain important or difficult topics. Enriched classes may cover a unit in two weeks, while others may take four or more weeks.



*Teacher’s Resource Book

Review and Testing

The authors of *Houghton Mifflin Mathematics* recognize the importance of skill reinforcement so that students remember what they have been taught from week to week and from year to year. The textbook and *Teacher's Resource Book* have been designed to provide efficient review and testing resources at the times when they will be most useful. The program contains the following features.

An optional **Pretest** in the TRB. This will be especially useful early in the school year to gauge your students' ability. However, some students may have already learned some later topics in different strands, so the pretest may be used with discretion throughout the school year. Once the level of the students' ability has been placed, the pretest may still be used as a practice sheet or an extra post-test.

A **mid-unit Review** provides practice in all the objectives covered in the first half of a unit. As with all testing material, the questions are clearly labelled by objective. A chart in the TRB pinpoints the lesson and page number where the skill can be reviewed if necessary.

An **end-of-unit Review** provides practice in all the objectives of the second half of the unit and has the same diagnostic features as the mid-unit Review.

The **Test** in the textbook provides clusters of questions on each objective. The test may be designed simply for extra practice.

A **Post-test** is reproduced in the TRB and has the advantage that the students have had no prior access to it.

The **Looking Back** at the end of each unit provides extra practice and reinforcement in the strand covered by the previous unit.

Extra Practice is available for every lesson in Houghton Mifflin's Testing and Practice Masters. The half-page black-line masters are reproduced with answers in the TRB.

Cumulative Tests for groups of units are provided in the back of the textbook.

The back pages of the textbook also provide **Extra Practice** in core objectives of the grade level.

Unit 2

Pretest

Add or subtract

- $\begin{array}{r} 6 \\ +6 \\ \hline \end{array}$
- $\begin{array}{r} 11 \\ -8 \\ \hline \end{array}$
- $\begin{array}{r} 7 \\ +7 \\ \hline \end{array}$
- $\begin{array}{r} 8 \\ +9 \\ \hline \end{array}$
- $\begin{array}{r} 15 \\ -6 \\ \hline \end{array}$
- $5 + 8 =$
- $4 + 9 =$
- $10 - 7 =$
- $18 - 9 =$

- $\begin{array}{r} 41 \\ +26 \\ \hline \end{array}$
- $\begin{array}{r} 92 \\ +7 \\ \hline \end{array}$
- $\begin{array}{r} 35 \\ -12 \\ \hline \end{array}$
- $\begin{array}{r} 87 \\ -36 \\ \hline \end{array}$
- $\begin{array}{r} 48 \\ -18 \\ \hline \end{array}$
- $\begin{array}{r} 27 \\ +9 \\ \hline \end{array}$
- $\begin{array}{r} 43 \\ +8 \\ \hline \end{array}$
- $\begin{array}{r} 25 \\ +5 \\ \hline \end{array}$
- $\begin{array}{r} 36 \\ -7 \\ \hline \end{array}$
- $\begin{array}{r} 51 \\ -4 \\ \hline \end{array}$

REVIEW

Add

- $\begin{array}{r} 1 \\ +6 \\ \hline \end{array}$
- $\begin{array}{r} 2 \\ +9 \\ \hline \end{array}$
- $\begin{array}{r} 5 \\ +7 \\ \hline \end{array}$
- $\begin{array}{r} 8 \\ +5 \\ \hline \end{array}$
- $\begin{array}{r} 6 \\ +4 \\ \hline \end{array}$

TEST

UNIT 2

Add or subtract

Post-test

Unit 2

Add or subtract

- $\begin{array}{r} 7 \\ +5 \\ \hline \end{array}$
- $\begin{array}{r} 4 \\ +6 \\ \hline \end{array}$
- $\begin{array}{r} 8 \\ +7 \\ \hline \end{array}$
- $\begin{array}{r} 15 \\ -9 \\ \hline \end{array}$
- $\begin{array}{r} 16 \\ -7 \\ \hline \end{array}$
- $6 + 9 =$
- $9 + 7 =$
- $12 - 6 =$
- $17 - 8 =$

LOOKING BACK

ADD/SUBTRACT

Add

- $\begin{array}{r} 3 \\ +5 \\ \hline \end{array}$
- $\begin{array}{r} 24 \\ +4 \\ \hline \end{array}$
- $\begin{array}{r} 53 \\ +44 \\ \hline \end{array}$
- $\begin{array}{r} 430 \\ +19 \\ \hline \end{array}$
- $\begin{array}{r} 503 \\ +184 \\ \hline \end{array}$
- $\begin{array}{r} 9 \\ +6 \\ \hline \end{array}$
- $\begin{array}{r} 47 \\ +6 \\ \hline \end{array}$
- $\begin{array}{r} 25 \\ +36 \\ \hline \end{array}$
- $\begin{array}{r} 854 \\ +29 \\ \hline \end{array}$
- $\begin{array}{r} 626 \\ +137 \\ \hline \end{array}$
- $\begin{array}{r} 70 \\ +89 \\ \hline \end{array}$
- $\begin{array}{r} 64 \\ +58 \\ \hline \end{array}$
- $\begin{array}{r} 714 \\ +97 \\ \hline \end{array}$
- $\begin{array}{r} 507 \\ +197 \\ \hline \end{array}$
- $\begin{array}{r} 618 \\ +294 \\ \hline \end{array}$
- $\begin{array}{r} 1604 \\ +163 \\ \hline \end{array}$
- $\begin{array}{r} 8563 \\ +218 \\ \hline \end{array}$
- $\begin{array}{r} 5119 \\ +3467 \\ \hline \end{array}$
- $\begin{array}{r} 3669 \\ +4054 \\ \hline \end{array}$
- $\begin{array}{r} 2758 \\ +2758 \\ \hline \end{array}$

Extra Practice

Worksheet A1

Pages 22-23

Add or subtract

Cumulative Test

UNITS 1-4

Addition

Add

- $\begin{array}{r} 8 \\ +0 \\ \hline \end{array}$
- $\begin{array}{r} 9 \\ +4 \\ \hline \end{array}$
- $\begin{array}{r} 6 \\ +7 \\ \hline \end{array}$
- $\begin{array}{r} 3 \\ +5 \\ \hline \end{array}$
- $\begin{array}{r} 8 \\ +9 \\ \hline \end{array}$
- $9 + 7$
- $3 + 8$
- $4 + 5$
- $6 + 8$
- $7 + 9$
- $\begin{array}{r} 30 \\ +2 \\ \hline \end{array}$
- $\begin{array}{r} 74 \\ +6 \\ \hline \end{array}$
- $\begin{array}{r} 58 \\ +7 \\ \hline \end{array}$
- $\begin{array}{r} 56 \\ +5 \\ \hline \end{array}$
- $\begin{array}{r} 9 \\ +36 \\ \hline \end{array}$
- $\begin{array}{r} 36 \\ +51 \\ \hline \end{array}$
- $\begin{array}{r} 46 \\ +27 \\ \hline \end{array}$
- $\begin{array}{r} 62 \\ +24 \\ \hline \end{array}$
- $\begin{array}{r} 58 \\ +33 \\ \hline \end{array}$
- $\begin{array}{r} 74 \\ +36 \\ \hline \end{array}$
- $\begin{array}{r} 4 \\ +2 \\ \hline \end{array}$
- $\begin{array}{r} 8 \\ +2 \\ \hline \end{array}$
- $\begin{array}{r} 24 \\ +41 \\ \hline \end{array}$
- $\begin{array}{r} 16 \\ +22 \\ \hline \end{array}$
- $\begin{array}{r} 356 \\ +194 \\ \hline \end{array}$
- $\begin{array}{r} 416 \\ +5 \\ \hline \end{array}$
- $\begin{array}{r} 607 \\ +8 \\ \hline \end{array}$
- $\begin{array}{r} 86 \\ +254 \\ \hline \end{array}$
- $\begin{array}{r} 846 \\ +57 \\ \hline \end{array}$
- $\begin{array}{r} 65 \\ +238 \\ \hline \end{array}$
- $\begin{array}{r} 407 \\ +305 \\ \hline \end{array}$
- $\begin{array}{r} 174 \\ +237 \\ \hline \end{array}$
- $\begin{array}{r} 335 \\ +176 \\ \hline \end{array}$
- $\begin{array}{r} 218 \\ +362 \\ \hline \end{array}$
- $\begin{array}{r} 699 \\ +105 \\ \hline \end{array}$
- $\begin{array}{r} 3857 \\ +153 \\ \hline \end{array}$
- $\begin{array}{r} 643 \\ +1228 \\ \hline \end{array}$
- $\begin{array}{r} 574 \\ +3268 \\ \hline \end{array}$
- $\begin{array}{r} 4369 \\ +138 \\ \hline \end{array}$
- $\begin{array}{r} 507 \\ +4197 \\ \hline \end{array}$
- $\begin{array}{r} 3594 \\ +5609 \\ \hline \end{array}$
- $\begin{array}{r} 2788 \\ +2585 \\ \hline \end{array}$
- $\begin{array}{r} 6487 \\ +1036 \\ \hline \end{array}$
- $\begin{array}{r} 3296 \\ +5917 \\ \hline \end{array}$
- $\begin{array}{r} 3897 \\ +5984 \\ \hline \end{array}$
- $\begin{array}{r} 0.4 \\ +0.3 \\ \hline \end{array}$
- $\begin{array}{r} 0.8 \\ +0.5 \\ \hline \end{array}$
- $\begin{array}{r} 6.9 \\ +4.7 \\ \hline \end{array}$
- $\begin{array}{r} 14.3 \\ +8.9 \\ \hline \end{array}$
- $\begin{array}{r} 97.32 \\ +187.67 \\ \hline \end{array}$
- $0.9 + 0.7$
- $41.8 + 2.7$
- $189.4 + 8.5$

Problem Solving

Problem Solving is an area of study receiving increased emphasis in the elementary mathematics curriculum. It is not enough for students simply to master basic mathematical skills. In today's world, they must be able to apply those skills to solve practical, real-world problems.

The first step in this process involves interpretation of simple, routine problem situations, given first in pictures, then in words. Beyond that, a complete mathematics program must give the students an armoury of strategies with which to attack all types of problems, routine and non-routine. Such strategies include drawing diagrams, guesswork, using a model, estimation, looking for patterns, making lists, simplifying or rewording the problem, and many more. In addition, *Houghton Mifflin Mathematics* teaches a simple four-step strategy for attacking routine word problems. See the Scope & Sequence on page T21 for a complete list of problem-solving objectives for this grade level.

Houghton Mifflin Mathematics deals with problem solving in six different ways.

1. Lesson Introductions.

Every possible lesson is introduced with a word problem. This puts the mathematical concept in a real-world context and also gives the student experience with the key words and phrases that may be used in problems associated with the mathematical objective.

2. Practice Section.

Every possible lesson includes more problems in the *Practice* section. The students are given experience with the different ways similar types of problems can be phrased. Thus, they should then be better able to recognize problems by type when they encounter them in sets of mixed problems.

3. Problem Solving Lessons.

Almost every unit has at least one full lesson on problem solving. These lessons teach the basic four-step strategy for routine word problems and also other strategies for attacking many types of problems.

4. Something Extra.

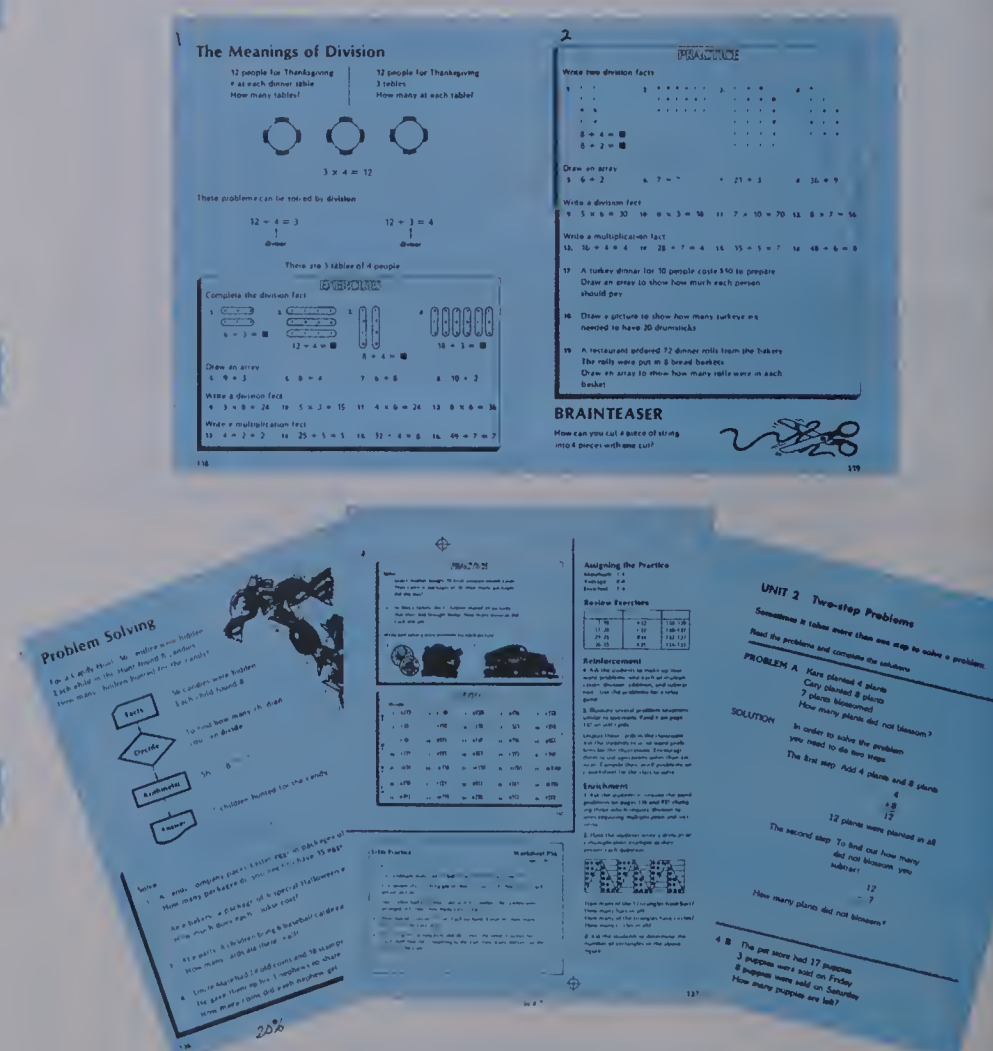
The section in the textbook at the bottom right of every lesson provides more challenging non-routine problems for enrichment.

5. Teacher's Resource Book and Practice Masters.

The Teacher's Resource Book provides extra material for all levels of ability. The Extra Practice sections provide more problems for the average student. These are available separately on Houghton Mifflin's *Testing and Practice Masters*. The *Reinforcement* sections provide ideas for alternative types of practice and for re-teaching for students of lower ability. The *Enrichment* section provides challenges for better students, and also give ideas for open-ended (divergent) mathematical investigations.

6. Problem Solving Activities.

Every grade level has a separate booklet of problem solving activities, correlated to the lessons in the textbook. These booklets provide ample opportunity for students to extend their problem solving abilities even further.

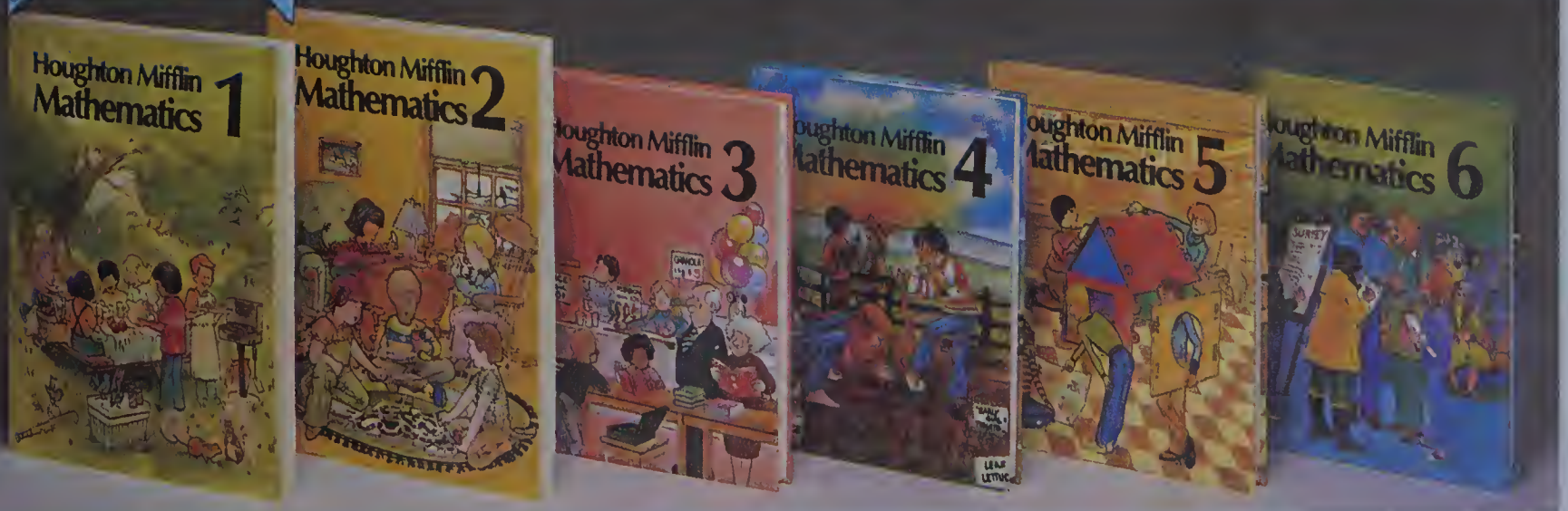


Mathematics for the 80's

Are these your priorities?

Problem Solving
Real-World Applications
In-Depth Developmental Lessons
One Strand Block Units
Ready-to-Use Teacher's Resource Books
Individualized Learning Materials
Testing and Management Programs
Year-Round Motivational Features

...Then here is your program!



Houghton Mifflin Mathematics

The Student Text and Teacher Resource Book

Student Objectives coded for easy tracking and reviewing.

Functional, full colour illustrations.

Introductory activity emphasizing prerequisite skills, using concrete experiences.

Textbook develops skills from problem solving, real world situations.

Lesson plan involving both concrete materials and textbook pages using pictorial representation (semi-concrete).

Developmental Exercises to work with the students to assure that the objective is mastered.

Teacher's Resource Book page number corresponds to pupil's textbook.

The Teacher's Resource Book provides black-and-white reproductions of the textbook pages with full answers and annotations.

UNIT 3 LESSON 2

Objective A10

Add two- and three-digit numbers, regroup tens.

Introducing the Lesson

Show the students the following models and ask them about the regrouping that should be done.



2 flats, 12 rods, 4 cubes

The students should decide that the 12 rods can be regrouped as 1 flat and 2 rods.



3 flats, 2 rods, 4 cubes

Summarize the modelling with these place-value charts:

100s	10s	1s	=	100s	10s	1s
2	12	4		3	2	4

Try several other similar examples.

Teaching the Lesson

Discuss the bowling problem at the top of page 48. Model the required addition with place-value number blocks. Point out that it is easiest to add cubes first.



"Adding cubes, there are 6. Add the rods. Since there are 12 rods, regroup them as 1 flat and 2 rods. Then add."



3 flats, 2 rods, 6 cubes
or, 3 hundreds, 2 tens, 6 ones
or, $300 + 20 + 6$
or, 326

Have the students practise modelling and recording several other similar addition examples. Use problems with three addends as well.

48

Regrouping Tens

MY SCORES ARE 175 AND 151. WHAT'S MY TOTAL?



Write the question

$$\begin{array}{r} 175 \\ + 151 \\ \hline \end{array}$$

Add ones

$$\begin{array}{r} 175 \\ + 151 \\ \hline 6 \end{array}$$

Add tens

$$\begin{array}{r} 175 \\ + 151 \\ \hline 12 \end{array}$$

12 tens is 1 hundred and 2 tens. Regroup

$$\begin{array}{r} 175 \\ + 151 \\ \hline 26 \end{array}$$

Add hundreds

$$\begin{array}{r} 175 \\ + 151 \\ \hline 326 \end{array}$$

$$\begin{array}{r} 175 \\ + 151 \\ \hline 326 \end{array}$$

The total score for the 2 games is 326

EXERCISES									
Add									
1. $\begin{array}{r} 47 \\ + 60 \\ \hline 107 \end{array}$	2. $\begin{array}{r} 52 \\ + 64 \\ \hline 116 \end{array}$	3. $\begin{array}{r} 65 \\ + 83 \\ \hline 148 \end{array}$	4. $\begin{array}{r} 90 \\ + 33 \\ \hline 123 \end{array}$	5. $\begin{array}{r} 81 \\ + 84 \\ \hline 165 \end{array}$	6. $\begin{array}{r} 347 \\ + 382 \\ \hline 729 \end{array}$	7. $\begin{array}{r} 152 \\ + 64 \\ \hline 216 \end{array}$	8. $\begin{array}{r} 565 \\ + 83 \\ \hline 648 \end{array}$	9. $\begin{array}{r} 290 \\ + 33 \\ \hline 323 \end{array}$	10. $\begin{array}{r} 381 \\ + 84 \\ \hline 465 \end{array}$
11. $\begin{array}{r} 274 \\ + 382 \\ \hline 656 \end{array}$	12. $\begin{array}{r} 490 \\ + 255 \\ \hline 745 \end{array}$	13. $\begin{array}{r} 528 \\ + 191 \\ \hline 719 \end{array}$	14. $\begin{array}{r} 742 \\ + 170 \\ \hline 912 \end{array}$	15. $\begin{array}{r} 382 \\ + 382 \\ \hline 764 \end{array}$	16. $\begin{array}{r} 451 \\ + 450 \\ \hline 901 \end{array}$	17. $\begin{array}{r} 163 \\ + 466 \\ \hline 629 \end{array}$	18. $\begin{array}{r} 283 \\ + 571 \\ \hline 854 \end{array}$	19. $\begin{array}{r} 394 \\ + 482 \\ \hline 876 \end{array}$	20. $\begin{array}{r} 671 \\ + 291 \\ \hline 962 \end{array}$

48

Using the Exercises

- Questions 1 to 5 are paired with Questions 6 to 10 to provide practice first with regrouping tens with two-digit addends and then with regrouping tens with a three- and a two-digit addend.
- Questions 11 to 20 provide examples with three-digit addends requiring the regrouping of tens.

Description of developmental exercises aids in teaching the skill and diagnosing problems.

provide a complete learning and teaching package.

PRACTICE

Find the sum

1. $\begin{array}{r} 52 \\ + 67 \\ \hline 119 \end{array}$	2. $\begin{array}{r} 78 \\ + 91 \\ \hline 169 \end{array}$	3. $\begin{array}{r} 43 \\ + 92 \\ \hline 135 \end{array}$	4. $\begin{array}{r} 60 \\ + 84 \\ \hline 144 \end{array}$	5. $\begin{array}{r} 35 \\ + 83 \\ \hline 118 \end{array}$
6. $\begin{array}{r} 161 \\ + 263 \\ \hline 424 \end{array}$	7. $\begin{array}{r} 472 \\ + 180 \\ \hline 652 \end{array}$	8. $\begin{array}{r} 553 \\ + 283 \\ \hline 836 \end{array}$	9. $\begin{array}{r} 661 \\ + 174 \\ \hline 835 \end{array}$	10. $\begin{array}{r} 391 \\ + 267 \\ \hline 658 \end{array}$
11. $\begin{array}{r} 274 \\ + 274 \\ \hline 548 \end{array}$	12. $\begin{array}{r} 451 \\ + 478 \\ \hline 929 \end{array}$	13. $\begin{array}{r} 584 \\ + 95 \\ \hline 679 \end{array}$	14. $\begin{array}{r} 293 \\ + 102 \\ \hline 395 \end{array}$	15. $\begin{array}{r} 341 \\ + 231 \\ \hline 572 \end{array}$

16. During a bowling tournament, Sam scored 180 and 178 for his first two games. What was Sam's total score for these two games? **358**

17. Joanne was practising for a bowling tournament and scored 189 and 191 on two games. What was her total score for the two games? **380**

Special Addition

The addition question below uses all of the digits from 1 to 9. Each digit is used just once.



Write up other addition questions like the ones above.

Answers may vary

49

Practice

Worksheet A10
Pages 48-49

Write the number as hundreds and tens.

1. 46 tens = 4 hundreds + 6 tens
2. 18 tens = 1 hundred + 8 tens

1. $\begin{array}{r} 343 \\ + 182 \\ \hline 525 \end{array}$	6. $\begin{array}{r} 256 \\ + 71 \\ \hline 327 \end{array}$	7. $\begin{array}{r} 480 \\ + 390 \\ \hline 870 \end{array}$	8. $\begin{array}{r} 544 \\ + 95 \\ \hline 639 \end{array}$	9. $\begin{array}{r} 347 \\ + 261 \\ \hline 608 \end{array}$
10. $\begin{array}{r} 182 \\ + 777 \\ \hline 959 \end{array}$	11. $\begin{array}{r} 396 \\ + 112 \\ \hline 508 \end{array}$	12. $\begin{array}{r} 68 \\ + 341 \\ \hline 409 \end{array}$	13. $\begin{array}{r} 290 \\ + 675 \\ \hline 965 \end{array}$	14. $\begin{array}{r} 328 \\ + 280 \\ \hline 608 \end{array}$

Assigning the Practice

Minimum: 1-10
Average: 1-17
Enriched: 6-17

Reinforcement

Students can make "adding machines" according to the following directions: Cut out two centimetre square strips. There should be at least 18 squares on each strip. Number the squares from left to right.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

To add, for example, $3 + 8$, move the bottom strip so its left end is at the edge of the '3' square of the top strip. Then find the '8' on the bottom strip. The sum of 3 and 8 is above the '8' on the bottom strip.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			

Enrichment

1. The *Special Addition* challenge, page 49, will have to be solved by a method of trial and error. It provides addition practice, but may be frustrating for all but the highly motivated students.

2. Ask the students to find a true statement about each:
- the sum of two even numbers;
 - the sum of two odd numbers; and
 - the sum of an even number and an odd number.

Problem Solving Activities

Assign Level 4, page 6.

Assignments for students of 3 levels of ability.

Practice exercises for skill mastery.

Reinforcement provides alternative types of practice and ideas for reteaching.

Word problems in every possible lesson.

Enrichment in both textbook and Teacher's Resource Book to keep the gifted child involved.

Extra Practice Masters (available separately) are reproduced here for every lesson.

Extra Problem Solving Activities (available separately) for each unit.

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Houghton Mifflin Mathematics was developed by an experienced team of educators and consultants from across Canada.

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Consultants: Gary Hatcher, Bill Hoppins, Judy Threadgill, George Williams, Peggy Williamson

Houghton Mifflin Mathematics

P

PROBLEM SOLVING

- ☐ Sequenced lessons teach problem solving strategies.
- ☐ The unique IDEA strategy keeps your pupils on track.
- ☐ Problem solving questions in every lesson maintain performance.

R

REAL-WORLD APPLICATIONS

- ☐ Every unit is developed through a real-world theme.
- ☐ Lessons are introduced by a real-world problem.
- ☐ Exercises include real-world applications.

I

IN-DEPTH DEVELOPMENTAL LESSONS

- ☐ Each lesson is devoted to a single objective.
- ☐ Skills are based upon understanding, using concrete materials.
- ☐ Developmental exercises make objectives easy to learn.

O

ONE STRAND BLOCK UNITS

- ☐ Each unit is devoted to the development of one strand.
- ☐ Each unit provides thorough practice for objectives.
- ☐ Each unit reviews, tests, and reinforces objectives.

R

READY-TO-USE TEACHER'S RESOURCE BOOKS

- ☐ The Resource Book contains detailed lesson plans.
- ☐ The Resource Book provides both reinforcement and enrichment activities.
- ☐ The Resource Book has complete answers to exercises and practice.

I

INDIVIDUALIZED LEARNING MATERIALS

- ☐ Every unit provides Pre-tests and Post-tests for readiness and assessment.
- ☐ Every unit has provisions for remediation and enrichment.
- ☐ Every unit has built-in reviews and cumulative reviews

T

TESTING AND MANAGEMENT PROGRAMS

- ☐ The textbook has unit tests and cumulative tests.
- ☐ The Resource Book contains extra practice and evaluation material.
- ☐ The Resource Book uses coded objectives to establish a diagnostic system.

Y

YEAR-ROUND MOTIVATIONAL FEATURES

- ☐ Every lesson has functional and appealing artwork.
- ☐ Every lesson has a challenging "Something Extra" including calculator activities and computer literacy.
- ☐ Every unit has an interesting child-oriented theme.

Book 1

1-98001
1-98011
1-98021
1-98031

Pupil's Workbook
Teacher's Resource Book
Testing and Practice Masters
Problem Solving Activities

Book 2

1-98002
1-98012
1-98022
1-98032

Pupil's Workbook
Teacher's Resource Book
Testing and Practice Masters
Problem Solving Activities

Book 3

1-98003
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1-98023
1-98033

Pupil's Textbook
Teacher's Resource Book
Testing and Practice Masters
Problem Solving Activities

Book 4

1-98004
1-98014
1-98024
1-98034

Pupil's Textbook
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Problem Solving Activities

Book 5

1-98005
1-98015
1-98025
1-98035

Pupil's Textbook
Teacher's Resource Book
Testing and Practice Masters
Problem Solving Activities

Book 6

1-98006
1-98016
1-98026
1-98036

Pupil's Textbook
Teacher's Resource Book
Testing and Practice Masters
Problem Solving Activities

**Houghton Mifflin
Canada Limited**

**150 Steelcase Road West, Markham, Ontario L3R 1B2
(416) 495-1755 (416) 475-1755 after March 21, 1982**

Learning Objectives

The following objectives are covered in depth in *Houghton Mifflin Mathematics 6*.

Numeration

		Lesson	Pages
N1	Read and write numerals to hundred millions.	1-1	2-3
N2	Extend the numeration system to billions.	1-2	4-5
N3	Compare up to nine-digit numerals using $<$, $=$, and $>$.	1-3	6-7
N4	Round to the nearest thousand, ten thousand, hundred thousand, and million.	1-4	8-9
N5	Write tenths and hundredths using decimal notation.	1-5	10-11
N6	Write decimals greater than one.	1-6	12-13
N7	Write thousandths and ten-thousandths using decimal notation.	1-7	14-15
N8	Annex zeros to write equivalent decimals.	1-8	16-17
N9	Compare decimals using $<$, $=$, or $>$.	1-9	18-19
N10	Round to the nearest whole number, tenth, hundredth, and thousandth.	1-10	20-21
N11	Identify the numerator and the denominator of a fraction.	7-1	146-147
N12	Compare fractions.	7-4	152-153
N13	Write mixed numerals as fractions.	7-5	154-155
N14	Write fractions as mixed numerals.	7-6	156-157
N15	Understand the concept of ratio; determine ratios from given facts; interpret ratios as fractional parts and fractional parts as ratios.	9-3	198-199
N16	Understand the concept of equivalent ratios; calculate such ratios.	9-4	200-201
N17	Understand the concept of percent; determine percents from given facts.	9-6	204-205
N18	Express fractions as percents.	9-7	206-207
N19	Express percents as fractions.	9-8	208-209
N20	Understand the concept of a reciprocal; give the reciprocal of a number.	10-1	218-219
N21	Understand positive and negative numbers.	13-3	294-295
N22	Order positive and negative numbers.	13-4	296-297

Arithmetic

		Lesson	Pages
A1	Add two- and three-digit numbers.	2-1	26-27
A2	Add four-digit and five-digit numbers.	2-2	28-29
A3	Add tenths, hundredths, and thousandths.	2-4	32-33
A4	Add more than two addends.	2-5	34-35
A5	Subtract two- and three-digit numbers.	2-6	36-37
A6	Subtract four- and five-digit numbers.	2-7	38-39
A7	Subtract tenths, hundredths, and thousandths.	2-9	42-43
A8	Multiply two-, three-, and four-digit numbers by a one-digit number.	3-1	50-51
A9	Multiply two- and three-digit numbers by a two-digit number.	3-2	52-53
A10	Multiply two 3-digit numbers.	3-3	54-55
A11	Multiply two 3-digit numbers with a zero in the multiplier.	3-4	56-57
A12	Use exponents to write repeated multiplications.	3-5	58-59
A13	Estimate products.	3-6	60-61
A14	Multiply one-, two-, and three-digit whole numbers and a decimal in tenths.	3-8	64-65
A15	Multiply one-, two-, and three-digit whole numbers and a decimal in hundredths.	3-9	66-67
A16	Divide a two-digit dividend by a one-digit divisor with a remainder.	4-1	74-75
A17	Divide a two- or three-digit dividend by a one-digit divisor.	4-2	76-77
A18	Divide a three- or four-digit dividend by a one-digit divisor.	4-3	78-79
A19	Divide a four- or five-digit dividend by a one-digit divisor with a zero in the quotient.	4-4	80-81
A20	Divide a three- or four-digit dividend by a multiple of ten.	4-5	82-83
A21	Divide a three-digit dividend by a two-digit divisor with a one-digit quotient.	4-6	84-85
A22	Divide a three- or four-digit dividend by a two-digit divisor with a two-digit quotient.	4-7	86-87
A23	Divide a four- or five-digit dividend by a two-digit divisor with a three-digit quotient.	4-8	88-89
A24	Divide a five-digit dividend by a two-digit divisor with a four-digit quotient.	4-9	90-91
A25	Understand the concept of multiples; find the LCM.	6-1	122-123

A26	Understand the concept of divisibility; know and apply the rules of divisibility by 2, 3, 4, 5, 6, 9, and 10.	6-2	124-125
A27	Understand the concept of factor; find the GCF.	6-3	126-127
A28	Understand the concepts of prime number and composite number.	6-4	128-129
A29	Find the prime factors of a number using a factor tree.	6-5	130-131
A30	Simplify number expressions by doing multiplication and division before addition and subtraction.	6-6	132-133
A31	Simplify number expressions by doing the work inside the parentheses first.	6-7	134-135
A32	Understand how a number machine works; calculate the output value, given the rule.	6-8	136-137
A33	Solve simple equations.	6-9	138-139
A34	Write equivalent fractions.	7-2	148-149
A35	Write the simplest form of a fraction.	7-3	150-151
A36	Write fractions as decimals.	7-7	158-159
A37	Find the fractional part of a set using a unit fraction.	7-8	160-161
A38	Find the fractional part of a set using more than a unit fraction.	7-9	162-163
A39	Multiply a fraction and a whole number.	8-1	170-171
A40	Multiply a fraction by a fraction.	8-2	172-173
A41	Multiply a mixed numeral by a fraction or a whole number.	8-3	174-175
A42	Multiply a decimal greater than 1 by a whole number.	8-5	178-179
A43	Multiply a decimal less than 1 in tenths by a decimal in the same form.	8-6	180-181
A44	Multiply a decimal greater than 1 in tenths by a decimal in the same form.	8-7	182-183
A45	Multiply a decimal less than 1 in hundredths by a decimal less than 1 in tenths.	8-8	184-185
A46	Multiply a decimal greater than 1 in hundredths by a decimal greater than 1 in tenths.	8-9	186-187
A47	Understand the concept of rates involving prices; calculate such rates from given facts.	9-1	194-195
A48	Understand the concept of rates involving time and speed; calculate such rates from given facts.	9-2	196-197
A49	Find a percent of a number using decimals.	9-9	210-211
A50	Divide a fraction by a whole number.	10-2	220-221
A51	Divide a whole number or a fraction by a unit fraction.	10-3	222-223
A52	Divide a whole number or fraction by a fraction.	10-4	224-225
A53	Divide a decimal by a one- or two-digit whole number (no remainder).	10-5	226-227
A54	Divide a whole number or a decimal by a decimal in tenths (no remainder).	10-6	228-229
A55	Divide a whole number or a decimal by a decimal in hundredths (no remainder).	10-7	230-231
A56	Divide a whole number or a decimal by a whole number or a decimal in tenths or hundredths, with remainders. Round the quotient to the nearest tenth or hundredth.	10-8	232-233
A57	Express a fraction as a decimal; round the quotient to the nearest tenth or hundredth.	10-9	234-235
A58	Find the range and the mode.	11-1	242-243
A59	Find the mean.	11-2	244-245
A60	Find the median.	11-3	246-247
A61	Add fractions with the same denominators, with regrouping.	14-1	314-315
A62	Add fractions with different denominators where one denominator is a multiple of the other.	14-2	316-317
A63	Add fractions with different denominators.	14-3	318-319
A64	Add mixed numerals.	14-4	320-321
A65	Subtract fractions with different denominators where one denominator is a multiple of the other.	14-5	322-323
A66	Subtract fractions with different denominators.	14-6	324-325
A67	Subtract mixed numerals, without regrouping.	14-7	326-327
A68	Subtract mixed numerals.	14-8	328-329
A69	Determine probability.	14-9	330-331

Graphing

		Lesson	Pages
GR1	Read and construct bar graphs.	11-4	248-249
GR2	Read and construct line graphs.	11-5	250-251
GR3	Read and construct circle graphs.	11-8	256-257
GR4	Read and write coordinates.	11-9	258-259
GR5	Generate and graph ordered pairs from a given rule.	13-1	290-291
GR6	Locate and plot points on the full coordinate plane.	13-5	298-299

Measurement

		Lesson	Pages
M1	Add with money.	2-3	30-31
M2	Subtract with money.	2-8	40-41
M3	Multiply with cents and dollars.	3-7	62-63
M4	Determine the appropriate units for measuring length.	5-1	98-99
M5	Find the perimeter of a figure.	5-2	100-101
M6	Determine the appropriate units for measuring area.	5-3	102-103
M7	Find the area of a rectangle and of a triangle.	5-4	104-105
M8	Find the circumference and the area of a circle.	5-5	106-107
M9	Find the volume of a rectangular prism.	5-6	108-109
M10	Determine the appropriate units for measuring mass.	5-7	110-111
M11	Determine the appropriate units for measuring capacity.	5-8	112-113
M12	Learn how volume, capacity, and mass are related by the measurement of water.	5-9	114-115
M13	Use the twenty-four hour clock.	5-10	116-117
M14	Identify angles and use the terms vertex, right angle, straight angle, perpendicular, acute, and obtuse.	11-6	252-253
M15	Measure angles in degrees.	11-7	254-255
M16	Read and interpret temperatures above and below 0°C.	13-2	292-293

Geometry

		Lesson	Pages
G1	Describe a slide on a coordinate grid.	12-1	266-267
G2	Recognize figures with line symmetry.	12-2	268-269
G3	Describe a flip on a coordinate grid.	12-3	270-271
G4	Describe a turn on a coordinate grid.	12-4	272-273
G5	Identify slides, flips, and turns on coordinate grids.	12-5	274-275
G6	Identify congruent triangles.	12-6	276-277
G7	Name corresponding parts (sides, angles, and vertices) of congruent triangles.	12-7	278-279
G8	Label angles and recognize perpendicular and parallel lines.	12-8	280-281
G9	Classify triangles by angles and sides.	12-9	282-283
G10	Classify quadrilaterals.	12-10	284-285
G11	Identify tessellations and figures that can be used to make tessellations.	13-7	302-303
G12	Recognize similar figures and the corresponding parts of similar figures.	13-8	304-305
G13	Read scale drawings and calculate distances from scales.	13-9	306-307

Problem Solving

		Lesson	Pages
PS1	Read and interpret charts to solve comparison and ordering problems.	1-11	22
PS2	Recognize words and phrases associated with addition and subtraction in word problems.	2-10	44-45
PS3	Use mental computation to solve simple addition, subtraction, multiplication, and division problems.	3-10	68-69
PS4	Choose the correct operation in solving a word problem.	4-10	92-93
PS5	Write an equation for a word problem.	6-10	140-141
PS6	Identify extraneous information and insufficient information in word problems.	7-10	164-165
PS7	Use formulas to find the measurements of geometric figures.	8-4	176-177
PS8	Make a table or diagram to help solve a word problem.	8-10	188-189
PS9	Use a proportion as a strategy in solving problems involving multiplication and division.	9-5	202-203
PS10	Solve problems involving percents.	9-10	212-213
PS11	Solve problems using a <i>Guess and Check</i> strategy.	10-10	236-237
PS12	Solve problems by analogies with simpler problems.	11-10	260-261
PS13	Use patterns to solve problems.	13-6	300-301
PS14	Solve two-step and three-step problems.	13-10	308-309
PS15	Use diagrams and models to solve problems.	14-10	332-333

Student Record Chart

for Pretests, Book Tests, and Post-tests

Numeration

N1					
N2					
N3					
N4					
N5					
N6					
N7					
N8					
N9					
N10					
N11					
N12					
N13					
N14					
N15					
N16					
N17					
N18					
N19					
N20					
N21					
N22					

Arithmetic

A1					
A2					
A3					
A4					
A5					
A6					
A7					
A8					
A9					
A10					
A11					
A12†					
A13					
A14					
A15					
A16					
A17					
A18					
A19					
A20					
A21					
A22					
A23					
A24					
A25					

A26†					
A27					
A28					
A29					
A30					
A31					
A32					
A33					
A34					
A35					
A36					
A37					
A38					
A39					
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A62					
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A65					
A66					
A67					
A68					
A69					

Measurement

M1				
M2				
M3				
M4				
M5				
M6				
M7				
M8				
M9				
M10				
M11				
M12				
M13				
M14				
M15				
M16				

Geometry

G1				
G2				
G3				
G4				
G5				
G6				
G7				
G8				
G9				
G10				
G11				
G12				
G13				

Graphing

GR1				
GR2				
GR3				
GR4				
GR5				
GR6				

†Two questions per box.

Scope & Sequence

4

5

6

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Percent/256-259
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 Time/280-281
 Order of operations/302-303
 Distributive, commutative, and associative properties/304-305
 Estimation/212-213
 Fractions/314-315, 320-321
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Basic facts/25
 Regrouping/26-29
 More than two addends/34-35
 Decimals/32-33
 Money/30-31
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 Fractions/324-325
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 Two-digit divisors/82-91
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UNIT 1

Place Value

Theme: Canadian Geography

Lesson	Objective		Page
Preview		Read and write numerals to thousands.	1
1	N1	Read and write numerals to hundred millions.	2-3
2	N2	Extend the numeration system to billions.	4-5
3	N3	Compare up to nine-digit numerals using $<$, $=$, and $>$.	6-7
4	N4	Round to the nearest thousand, ten thousand, hundred thousand, and million.	8-9
5	N5	Write tenths and hundredths using decimal notation.	10-11
6	N6	Write decimals greater than one.	12-13
7	N7	Write thousandths and ten-thousandths using decimal notation.	14-15
8	N8	Annex zeros to write equivalent decimals.	16-17
9	N9	Compare decimals using $<$, $=$, or $>$.	18-19
10	N10	Round to the nearest whole number, tenth, hundredth, and thousandth.	20-21
11	PS1	Read and interpret charts to solve comparison and ordering problems.	22
Test		Place value	23

About This Unit

The purpose of this unit is to:

1. develop an understanding of the base ten (or decimal) numeration system.
2. develop skills in reading and writing whole numbers having up to twelve digits in standard form, expanded form, and words.
3. develop skills in reading and writing decimals from tenths to ten-thousandths in standard form, expanded form, fractions, and words.
4. develop skills in comparing whole numbers and decimal fractions.
5. develop skills in rounding whole numbers and decimal fractions.
6. develop the ability to read and interpret charts.

The instructional strategy follows a developmental sequence. At first, the student learns the meaning of digit ("digit" means "finger" and we have **ten** fingers) and that our numeration system has 10 digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. Next, the student learns that several digits can make up a numeral and that each digit in a numeral has three types of value. For example, the 6 in 465 has *face value*, *place value*, and *total value*.

4**6**5

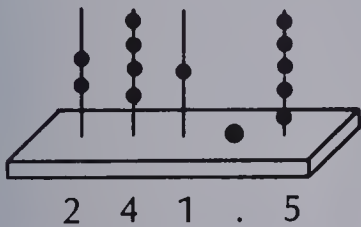
Face value is 6.
Place value is 6 tens.
Total value is 60.

The student also becomes aware of the patterns of 10 in our number system. For example, each place is 10 times greater in value than the place to its right. Or, each place is $\frac{1}{10}$ of the value of the place to its left. Discussions of the 10 patterns lead to the understanding of why it is called a *decimal* number system.

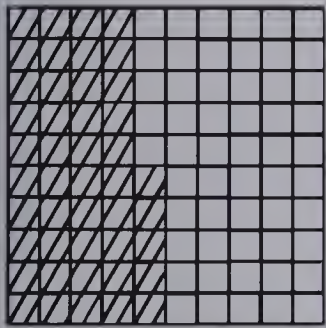
In this unit, a place-value abacus, a place-value chart, and/or shaded squares are used to help students understand place value of whole numbers and decimal fractions. For example:

100 000s	10 000s	1000s	100s	10s	1s
3	7	2	1	5	6

$$300\,000 + 70\,000 + 2000 + 100 + 50 + 6 = 372\,156$$



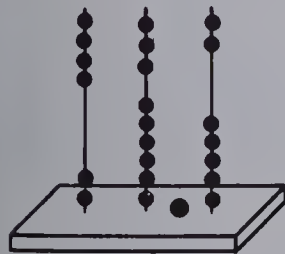
$$200 + 40 + 1 + 0.5 = 241.5$$



$$0.4 + 0.05 = 0.45$$

$$\frac{45}{100} \text{ or } 0.45$$

If the students understand the nature of place value, then learning the strategies for addition, subtraction, multiplication, and division of whole numbers and decimals is made easier. For example:



10s	1s	$\frac{1}{10}$ s
4	3	2
2	6	5
6	9	7

$$\begin{array}{r} 43.2 \\ +26.5 \\ \hline 69.7 \end{array}$$

Throughout this book, the words *number* and *numeral* are used properly where the distinction is clear. A *numeral* is a written symbol for a *number*. The word *number* is used when the distinction is vague. For example, in comparing numbers, the process involves examining the digits of the numerals. However, as a comparison of quantities is involved, we still speak of “comparison of 2-digit numbers”. It is wise *not* to make too much of this distinction with the students, but to use the words properly whenever the distinction is clear.

Ideas

The theme of Unit 1 is *Canadian Geography*. Atlases and maps of Canada, the provinces, and your own city will be very useful for reinforcing the lessons.

Discussions may be extended from social studies classes to include comparisons of distances, population, government budgets, map scales, and any other contexts in which numbers from thousandths to billions are used.

Encourage the children to contribute examples appropriate to each lesson. Where do we use billions? Why do we need to compare numbers? When do we use rounded numbers? And so on.

UNIT 1

PLACE VALUE



Unit 1 Objective	Test Questions	Pages
N1	1-4	2-3
N2	5-10	4-5
N3	11, 12	6-7
N4	13-15	8-9
N5	16, 21, 23-25	10-11
N6	17, 20-22	12-13
N7	18, 19, 26, 27	14-15
N8	28-30	16-17
N9	31-33	18-19
N10	34-36	20-21

Pretest

Unit 1

Write in expanded form.

1. 37 572 30 000 + 7000 + 500 + 70 + 2 2. 6 402 470 6 000 000 + 400 000 + 2000 + 400 + 70
3. 973 096 008 900 000 000 + 70 000 000 + 3 000 000 + 90 000 + 6000 + 8

Write in standard form.

4. eighty-one million twenty thousand thirteen 81 020 013
5. thirty-nine billion six hundred six million nine 39 606 000 009
6. seven hundred billion seven hundred million seven hundred 700 700 000 700

Write the place value of the underlined digit.

7. 649 286 104 062 2 hundred millions 8. 95 137 549 126 5 billions
9. 297 158 489 776 9 ten billions 10. 624 100 723 527 6 hundred billions

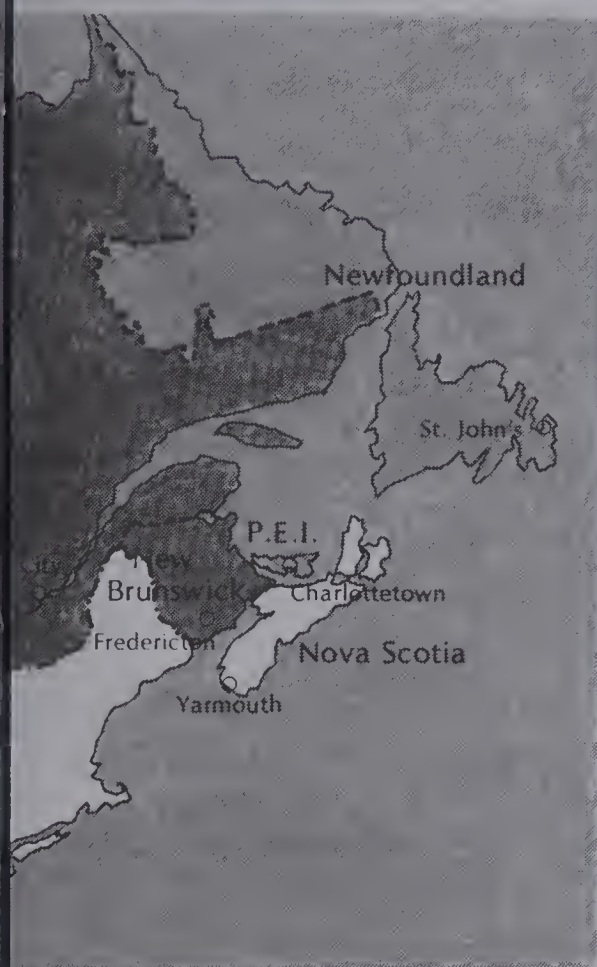
Complete using < or >.

11. 47 372 > 47 273 12. 92 528 < 92 529

The numbers below represent highway distances in kilometres from Fredericton, New Brunswick.

Match them to the cities on the road signs.

- 6674 2. 5739 3. 4598
 4000 + 70 **4070**
 3000 + 400 + 40 + 7 **3447**
 500 + 7 + 2000 + 20 **2527**
 6 + 500 + 80 **586**
 two hundred eighty **280**
 three hundred seventy-three **373**
 one thousand seven hundred seventy-seven **1777**

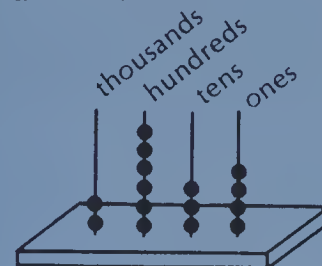


1. Whitehorse
2. Victoria
3. Edmonton
4. Saskatoon
5. Brandon
6. Thunder Bay
7. Quebec City
8. Yarmouth
9. Charlottetown
10. St. John's



Suggestions

Using a place-value abacus, point out the value of the ones, tens, hundreds, and thousands place in four-digit numerals. For example, illustrate the numeral 2634.



Explain that this numeral has 2 thousands, 6 hundreds, 3 tens, and 4 ones. Write the *place value* of each digit on the chalkboard as this sum:

2000 + 600 + 30 + 4. Point out that this sum is the **expanded form** of the numeral 2634. Explain that 2634 is the **standard form** of the numeral. Have the students practise writing several three- and four-digit numerals in both standard and expanded form.

Ask several students to read numerals written in standard form.

1009 → "One thousand nine."
 (not "one thousand and nine")

About the Page

Once the students have written the ten numerals on page 1 in standard form, they must understand that these represent distances from the ten cities shown on these two pages to Fredericton.

The questions should be solved by judging relative distances from Fredericton and ordering the numbers. The distances are **road distances** so the scale cannot be directly used to solve the problem.

Enrichment

1. Ask the students to write all possible four-digit numerals using each of the digits 2, 4, 6, and 8 only once.

2. Ask the students to look up the meaning of these words in the dictionary: decimal, December, decade, decimetre, decapod, Decapolis, decahedron, and decagon. Have them compare their definitions and note the meaning of the "dec-" prefix.

Round 6 876 101 to the nearest
 13. thousand **6 876 000** 14. hundred thousand **6 900 000** 15. million **7 000 000**

Write as a decimal in standard form.

16. $0.7 + 0.08$ **0.78** 17. $30 + 2 + 0.7 + 0.01$ **32.71**
 18. $5 + 0.9 + 0.06 + 0.005$ **5.965** 19. $0.01 + 0.004 + 0.0003$ **0.0143**

20. twenty and six hundredths **20.06**

21. four and fourteen hundredths **4.14**

22. ninety-three and three tenths **93.3**

23. $\frac{7}{10}$ **0.7** 24. $\frac{95}{10}$ **9.5** 25. $\frac{6}{100}$ **0.06** 26. $\frac{38}{1000}$ **0.038** 27. $\frac{12}{10\ 000}$ **0.0012**

Complete.

28. $0.7 = 0.$ **700** 29. $52.$ **70** $= 52.7$ 30. $4.08 = 4.$ **080**

Complete using < or >.

31. 5.09 **<** 5.9 32. 8 **>** 7.9 33. 32.79 **>** 32.779

Round 8.7526 to the nearest

34. tenth **8.8** 35. hundredth **8.75** 36. thousandth **8.753**

UNIT 1 LESSON 1

Objective N1

Read and write numerals to hundred millions.

Introducing the Lesson

Point out the amount of Canada's forest land at the top of page 2: 323 296 000 ha. To develop the understanding of a **hectare**, draw a square metre on the chalkboard. Use the square metre to help the students visualize a 10 m by 10 m grid (perhaps the size of a classroom). Then point out that this 10 m by 10 m grid (or classroom) is the approximate size of one **are**. $100 \text{ m}^2 = 1 \text{ a (are)}$ Using the classroom as an approximation of one are, help the students visualize that a 10 by 10 grid of classrooms (or 100 classrooms) would approximate the size of a **hectare**. $100 \text{ a} = 1 \text{ ha}$ Going one step further, $100 \text{ ha} = 1 \text{ km}^2$.

Teaching the Lesson

Discuss the names of the first nine whole number places in the base ten (or decimal) number system. Explain that large numbers are grouped in "families" and that, like a family, they have a last name. As we read a large number we say the "family" name: 323 **million**, 296 **thousand**. Show how a space is left between each "family" when the number is written in standard form.

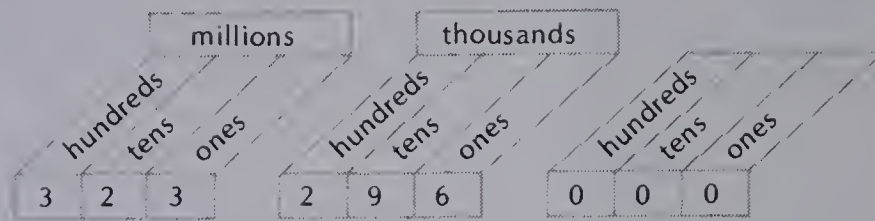
Point out that each place in the base ten number system is 10 times greater than the place to its right.

Have the students look for patterns such as: 1 000 000 has 6 zeros and is 10 multiplied by itself 6 times.

Illustrate several five-, six-, seven-, eight-, and nine-digit numerals on a place-value abacus. (If one is not available, use a chalkboard or overhead projector drawing.) Ask the students to determine the value of each place and to record the **expanded form** of each numeral on the board. Then the **standard form** of the numeral can be asked for. Have the students read the numerals properly, also. Watch that the word "and" is not used.

Thousands and Millions

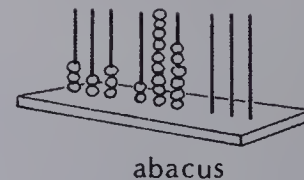
Canada's Forest Land
323 296 000 ha (hectares)



Expanded form: $300\,000\,000 + 20\,000\,000 + 3\,000\,000 + 200\,000 + 90\,000 + 6\,000$

Standard form: 323 296 000

Words: three hundred twenty-three million two hundred ninety-six thousand



abacus

EXERCISES

Write in expanded form.

1. 7062

2. 3 075 021

3. 417 120 000

$7000 + 60 + 2$

$3\,000\,000 + 70\,000 + 5\,000 + 20 + 1$

Write in standard form.

$400\,000\,000 + 10\,000\,000 + 700\,000 + 100\,000 + 20\,000$

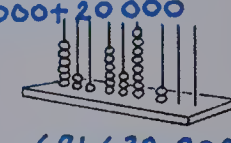
4. $600\,000 + 70\,000 + 3\,000 + 500 + 20 + 8$

6. $7\,000\,000 + 70\,000 + 4$

7. $800\,000\,000 + 90\,000\,000 + 200$

8. three hundred million thirty-three

9. eighty-five million six thousand seven



621 638 200

Write the next five whole numbers.

10. 1 000 000

11. 22 287 562

12. 5 409 389

13. 99 999

14. 99 999 999

15. 281 999

Write the place value of the 7 in each numeral.

16. 703 125

17. 72 125 000

18. 709 586 214

- 2 16. 7 hundred thousands 17. 7 ten millions
18. 7 hundred millions

Using the Exercises

- Questions 1 to 3 involve writing numbers in expanded form.
- Questions 4 to 9 require that the standard form of a number be written. Check that students place zeros correctly in their numerals.
- Questions 10 to 15 have the students write the next five numerals.
- Questions 16 to 18 involve writing the place value of the 7 in each numeral. Note that each numeral has a different number of digits.

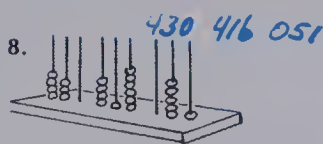
PRACTICE

Write the place value of the underlined digit.

1. 7 2 056 ^{4 ten thousands}
2. 6 328 429 ^{8 thousands}
3. 4 8 964 307 ^{4 ten millions}
4. 500 000 000 ^{0 millions}
5. 7 95 162 004 ^{7 hundred millions}
6. 202 5 69 328 ^{5 hundred thousands}

Write in standard form.

7. two million two thousand twenty-two ^{2 002 022}
9. fifty-six million fifty-six ^{56 000 056}
10. thirty-nine million three hundred ^{39 000 300}
11. Canada's coastline is over two hundred forty-one thousand four hundred two kilometres long. ^{241 402}
12. The Canada-United States boundary is eight thousand eight hundred ninety-two kilometres long. ⁸⁸⁹²



Write the next four numerals in the pattern.

13. 116 000 000, 118 000 000, 120 000 000, ■, ■, ■, ■
14. 28 400 000, 28 600 000, 28 800 000, ■, ■, ■, ■
15. 99 850, 99 900, 99 950, ■, ■, ■, ■

Our Forests

Hectares of Forest Land

Alta.	27 678 000	Nfld.	12 759 000	Que.	69 659 000
B.C.	54 534 000	N.S.	4 448 000	Sask.	12 829 000
Man.	13 558 000	Ont.	43 256 000	N.W.T.	23 254 000
N.B.	6 316 000	P.E.I.	251 000	Y.T.	54 754 000

Follow the pattern for **dividing by 100** to change hectares (ha) to square kilometres (km²).

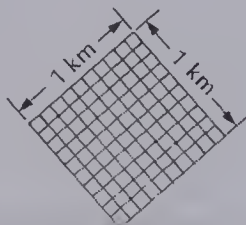
$$100 \text{ ha} = 1 \text{ km}^2$$

$$\text{Alta. } 27\,678\,000 \text{ ha} = 276\,780 \text{ km}^2$$

$$\text{B.C. } 54\,534\,000 \text{ ha} = 545\,340 \text{ km}^2$$

$$\text{Man. } \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

$$13\,558\,000 \text{ ha} = 135\,580 \text{ km}^2$$



3

Assigning the Practice

Minimum: 1-12

Average: 1-15

Enriched: 1-15

Reinforcement

1. Prepare a worksheet with these kinds of questions.

- Write a number with 7 in the:
 1. thousands place _____.
 2. millions place _____.
 3. ten thousands place _____.
 4. hundred millions place _____.
 - Complete.

147 836 092

 1. The 9 is in the _____ place.
 2. The 4 is in the _____ place.
 3. The 8 is in the _____ place.
 4. The 7 is in the _____ place.
 - Write a nine-digit number with 0 in the:
 1. hundred thousands place.
 2. ten thousands and hundreds places.
 3. millions and tens places.
 4. ten millions and ten thousands places.
2. Prepare a set of blank cards for a game with rules similar to those for "Rummy". Write 17 numerals in standard form, expanded form, and in words on 51 cards. Students must find the three forms of the numeral as they play.

Enrichment

1. Assign *Our Forests* at the bottom of page 3 after discussing the information given in the chart. Point out that hectares of forest land in Alberta and British Columbia have already been changed to square kilometres.

2. Have the students make a bar graph of the amounts of forest land in each province.

Extra Practice

Worksheet N1

Pages 2-3

Write the place value of the underlined digit.

1. 29 1 06 358 ^{6 thousands}
2. 4 6 247 109 ^{4 ten millions}
3. 726 247 165 ^{6 millions}
4. 874 1 95 262 ^{9 ten thousands}
5. 57 3 46 265 ^{3 hundred thousands}
6. 8 64 237 186 ^{8 hundred millions}

Write the numeral that is one less.

7. 54 011 54 010
8. 902 170 902 169
9. 5 485 799 _____
10. 38 649 100 _____
11. 10 000 9999
12. 26 502 700 _____

Write in standard form.

3. four hundred million sixty-two thousand 400 062 000
4. two million three hundred six thousand 2 306 000

UNIT 1 LESSON 2

Objective N2

Extend the numeration system to billions.*

Introducing the Lesson

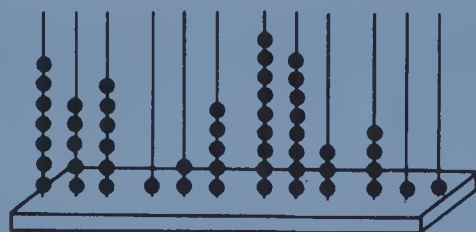
Begin a discussion of *population* referring to the number of people living in your city or town. Have the students estimate and then point out the actual figure. Lead the students to an estimate of the current world population and then explain that the 1980 World Almanac figure is 4 321 000 000. Compare this figure to the population of your town or city. Try to get the students to imagine a *billion*. "Besides people, what else could there be in billions?"

Teaching the Lesson

Point out the place-value chart for numbers in billions on page 4. Note the grouping of the digits in threes and the new group of three, *billions*. Review the idea that the number on the left is always *10 times* greater than the place to its right. "A billion is 10 times greater than a hundred million."

1 000 000 000 $\xleftarrow{\times 10}$ 100 000 000

Explain the *value* of each place in 4 321 000 000 by pointing out the *expanded form* shown on page 4. "The *value* of the 4 is 4 000 000 000. The *value* of the 3 is 300 000 000, etc." Ask someone to read the number properly *without* using the word, "and". To further understand place value to billions, take a place-value abacus and ask a student to show 756 125 983 411 on it.



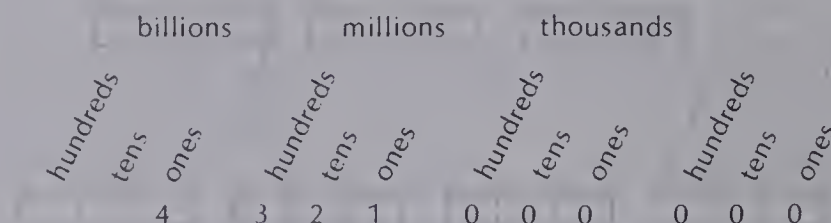
Another student could write this numeral in expanded form and then read it properly. Continue this procedure with several other large numbers until the concepts are understood.

Billions



Canada's total population: 23 597 600
North America's total population: 363 000 000
World population: 4 321 000 000

The world population is in **billions** or thousands of millions. (In some countries, a billion is a million million.)



Expanded form: 4 000 000 000 + 300 000 000 + 20 000 000 + 1 000 000

Standard form: 4 321 000 000

Words: four billion three hundred twenty-one million

EXERCISES

Write in standard form.

- 3 000 000 + 472 000 + 134 **3 472 134**
- 4 000 000 000 + 378 000 000 + 250 **4 378 000 250**
- 75 000 000 000 + 600 000 **75 000 600 000**
- 32 000 000 000 + 568 **32 000 000 568**
- forty-three billion three hundred fifty-one thousand **43 000 351 000**
- five billion five million five thousand five **5 005 005 005**
- three hundred billion three hundred thousand three **300 000 300 003**

Write in expanded form.

- 5 235 387 000
- 121 234 428 000
- 74 345 658 571
- 9 980 000 000

4

Using the Exercises

- Question 1 reviews millions from the previous lesson.
- Questions 3 to 5 extend the same type of exercise to billions. Watch for proper placement of zeros in the answers and reteach if necessary.
- Questions 6 to 8 use words and hence make proper placement of digits more difficult.
- Questions 9 to 12 reverse the process. Students should write the full expanded form as in the lesson example, not the briefer form given in Questions 1 to 5. This skill will be helpful in dealing with powers of ten and scientific notation in later years.

*In North America a billion is 10^9 or 1 000 000 000. In some other countries a billion is 10^{12} or 1 000 000 000 000.

PRACTICE

Write the place value of the 4 in each numeral.

- 3 7 4 3 6 2 5 0 0 0 **4 ten millions**
- 1 4 2 7 9 6 0 3 0 0 0 **4 ten billions**
- 4 7 3 5 6 2 0 0 0 0 0 **4 hundred billions**
- 6 4 1 0 9 3 5 7 0 0 0 **4 billions**

Write in standard form.

577 235 000 000

- 577 000 000 000 + 235 000 000
- 878 000 000 000 + 55 000 **878 000 055 000**
- 22 000 000 000 + 101 000 000 + 404 **22 101 000 404**
- 999 000 000 000 + 99 000 000 + 99 **999 099 000 099**
- forty-six billion three hundred million **46 300 000 000**
- seventy-five billion seventy-five thousand seventy-five **75 000 075 075**
- three hundred forty-one billion nine thousand twelve **341 000 009 012**



Write the next three numerals in the pattern.

- 41 500 000 000, 42 000 000 000, 42 500 000 000, ■, ■, ■
- 243 190, 245 190, 247 190, ■, ■, ■
- 8 175 260, 8 475 260, 8 775 260, ■, ■, ■
- 8 999 999 997, 8 999 999 998, 8 999 999 999, ■, ■, ■

Multiplying Magic

Copy and complete *without* multiplying.
Use the patterns.

999 × 2 = 1998	999 × 11 = 10 989	999 × 21 = ■ 20 979
999 × 3 = 2997	999 × 12 = 11 988	999 × 22 = ■ 21 978
999 × 4 = 3996	999 × 13 = ■ 12 987	999 × 23 = ■ 22 977
999 × 5 = ■ 4995	999 × 14 = ■ 13 986	999 × 24 = ■ 23 976
999 × 6 = ■ 5994	999 × 15 = ■ 14 985	999 × 25 = ■ 24 975
999 × 7 = ■ 6993	999 × 16 = ■ 15 984	999 × 26 = ■ 25 974
999 × 8 = ■ 7992	999 × 17 = ■ 16 983	999 × 27 = ■ 26 973
999 × 9 = ■ 8991	999 × 18 = ■ 17 982	999 × 28 = ■ 27 972
999 × 10 = ■ 9990	999 × 19 = ■ 18 981	999 × 29 = ■ 28 971
	999 × 20 = ■ 19 980	999 × 30 = ■ 29 970

Can you go further?

5

Assigning the Practice

Minimum: 1-12

Average: 1-16

Enriched: 1-16

Reinforcement

List the populations of the seven world continents on the chalkboard and ask the students to read each properly.

Direct the students to draw an abacus for each figure and write it in expanded form.

North America	363 000 000
Africa	457 000 000
Antarctica	—
Europe	685 800 000
South America	234 000 000
Asia	2 559 200 000
Australia	14 400 000

Enrichment

1. Assign *Multiplying Magic* at the bottom of page 5 and ask the students to investigate patterns with 4 or 5 nines. A calculator may be used.

2. The Ancient Egyptians grouped by tens and used pictures to write their numbers.

10 000	1000	100	10	1
				
bent finger	flower	coil	heelbone	tally

For example,

       = 1232

Write the lengths of these Canadian rivers in Ancient Egyptian numerals.

Yukon River: 3185 km

Mackenzie River: 4241 km

Nelson River: 2575 km

St. Lawrence River: 3058 km

3. Ask the students to make a bar graph of the populations of the seven world continents listed above in the Reinforcement.

Extra Practice

Worksheet N2

Pages 4-5

Write in expanded form.

- 236 172
- 81 421
- 32 106 000
- 92 175 000 002
- 9 216 109
- 608 000 806

Write the numeral that is one less.

- 1080 **1079**
- 100 000 **99 999**
- 1 000 100 **1 000 099**
- 1 000 000 **999 999**
- 1 000 000 000 **999 999 999**
- 101 000 000 **100 999 999**

Write in standard form.

- seventeen billion four hundred three million **17 403 000 000**
- two billion nine hundred million four hundred thousand **2 900 400 000**

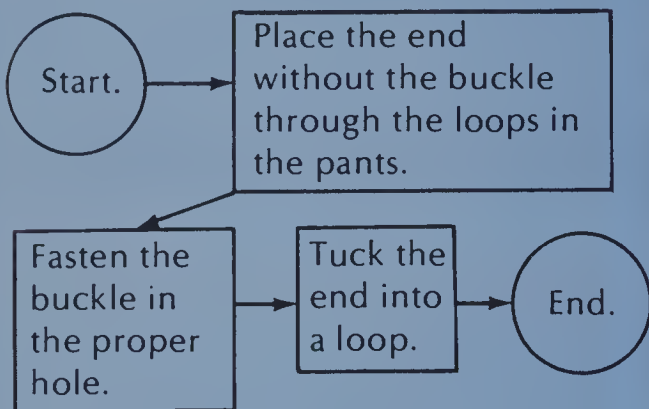
UNIT 1 LESSON 3

Objective N3

Compare up to nine-digit numerals using $<$, $=$, and $>$.

Introducing the Lesson

Introduce *flow charts* with a simple two-step task like putting on a belt. Point out how flow charts picture the solution to a problem (or task) from beginning to end.



Explain that after the start circle, each step is shown in a *rectangle*. Any “yes” or “no” decisions are shown in a *diamond*. The direction, or flow, of the problem from start to finish is indicated by arrows.

Teaching the Lesson

Have the students recall the symbols for comparing:

$9 > 7$ “Nine **is greater than** seven.”

$2 < 5$ “Two **is less than** five.”

$4 = 4$ “Four **equals** four.”

Point out the flow chart at the top of page 6 and follow the steps for comparing the given numbers, 75 186 and 74 986. Show how the numbers in the largest place are compared *first*.

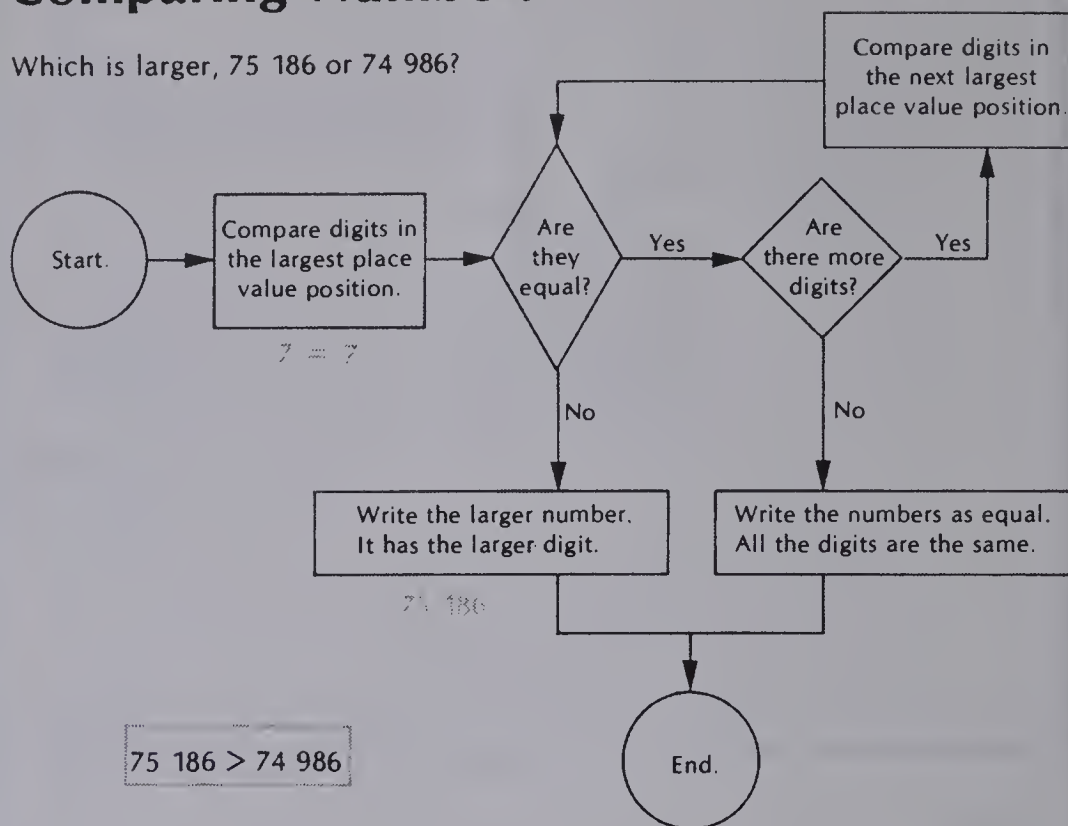
10 000s	1000s	100s	10s	1s
7	5	1	8	6
7	4	9	8	6

Compare ten thousands: $70\ 000 = 70\ 000$.
 Compare thousands: $5000 > 4000$.
 So: $75\ 186 > 74\ 986$.

Practise comparing several numbers having up to nine digits, stressing each time that one always begins the comparison of the numbers in the largest place-value positions.

Comparing Numbers

Which is larger, 75 186 or 74 986?



$75\ 186 > 74\ 986$

EXERCISES

Copy and complete. Use $<$, $=$, or $>$.

- $82\ 195 \blacksquare 82\ 195$ $=$
- $93\ 007 \blacksquare 91\ 989$ $>$
- $581\ 296 \blacksquare 581\ 301$ $<$
- $156\ 384 \blacksquare 156\ 384$ $=$
- $6\ 158\ 720 \blacksquare 6\ 158\ 721$ $<$
- $142\ 803 \blacksquare 143\ 308$ $<$
- $89\ 098\ 211 \blacksquare 89\ 089\ 422$ $>$
- $1\ 690\ 238 \blacksquare 997\ 678$ $>$
- $444\ 318\ 956 \blacksquare 444\ 318\ 996$ $<$
- $7\ 403\ 265 \blacksquare 7\ 304\ 265$ $>$

Write in order starting with the least.

- 5 76 195, 3 67 195, 1 17 695, 4 71 695, 2 61 795
- 3 8 231 052, 5 8 321 052, 1 8 123 052, 4 8 312 052, 2 8 132 052

Using the Exercises

- Questions 1 to 10 involve the comparison of two large numbers.
- Questions 11 and 12 require the student to order a set of five numbers. Point out the need for commas to separate the numbers as they are written.

PRACTICE

Copy and complete. Use $<$, $=$, or $>$.

1. 62 905 ■ 62 950 $<$
2. 4 058 243 ■ 4 058 234 $>$
3. 387 000 + 241 ■ 387 241 $=$
4. 1089 ■ 1089 $=$
5. 921 453 760 ■ 921 453 706 $>$
6. 60 000 + 600 + 6 ■ 60 606
7. 84 111 ■ 83 999 $>$
8. 987 321 ■ 987 123 $>$

9. Write these dates in order starting with the earliest.

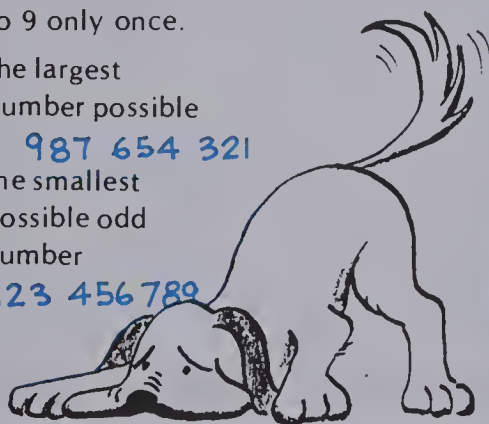
1837	Upper Canada Rebellion	1000
1608	Champlain established Quebec City.	1534
1885	Last spike driven for the CPR coast to coast.	1608
1812	War of 1812	1750
1750	Fort Toronto built	1759
1949	Newfoundland became a province.	1812
1534	Cartier discovered the Gulf of St. Lawrence.	1837
1000	Canada seen for the first time by Norsemen.	1858
1759	Battle of the Plains of Abraham	1867
1858	Gold found in the sandbars of the Fraser River.	1885
1867	Dominion of Canada is created.	1949

10. Make a time line showing the above events in Canada's history.

Number Search

Write 9-digit numerals. Use the digits 1 to 9 only once.

- a. the smallest number possible
123 456 789
- b. the largest number possible
987 654 321
- c. the smallest possible even number
123 456 798
- d. the smallest possible odd number
123 456 789
- e. the tenth largest even number



7

Assigning the Practice

Minimum: 1-9

Average: 1-9

Enriched: 1-10

Reinforcement

1. Assign *Number Search* at the bottom of page 7. Write the digits that may be used on the chalkboard. Point out that zero is not used.

2. Prepare the following worksheet.

- a. If $8423 > 8432$, circle Y. If not, circle S. Y S
- b. If $109\ 402 < 109\ 420$, circle U. If not, circle A. U A
- c. If one million = 1 000 000, circle C. If not, circle E. C E
- d. If $62\ 050 > 62\ 500$, circle R. If not, circle C. R C
- e. If $1\ 234\ 567 > 1\ 234\ 565$, circle E. If not circle O. E O
- f. If $8998 = 9889$, circle L. If not, circle S. L S
- g. If $69\ 105\ 274 > 69\ 015\ 274$, circle S. If not, circle R. R S

If you correctly answer the above questions, the circled letters spell a word. (Success)

Enrichment

1. Have the students analyse a simple task and write a flow chart to illustrate it.

2. To point out two other comparison signs (\geq "greater than or equal to" and \leq "less than or equal to") prepare a worksheet asking students to:

- a. List all multiples of $10 \leq 120$.
- b. List all numbers < 100 but ≥ 85 .
- c. List all multiples of $2 \leq 28$.
- d. List all numbers < 50 but ≥ 43 .
- e. List all numbers < 2000 but ≥ 1990 .
- f. List all numbers > 750 but ≤ 775 .
- g. List all multiples of $5 \leq 65$.
- h. List all numbers $> 23\ 490$ but $\leq 23\ 500$.

Extra Practice

Worksheet N3

Pages 6-7

Which of these pairs of numbers has more ten thousands?

290 137 or 546 821 _____ 2. 8 243 190 or 4 568 216 _____

39 870 045 or 86 102 975 _____ 4. 10 000 or 65 000 000 _____

Count by thousands from 97 000 to 105 000.

98 000, etc.

Count by ten thousands from 888 000 to 998 000

898 000, 908 000, etc.

Count by hundred thousands from 767 000 to 1 067 000.

867 000, 967 000

Count by millions from 694 185 000 to 710 185 000.

695 185 000, etc.

UNIT 1 LESSON 4

Objective N4

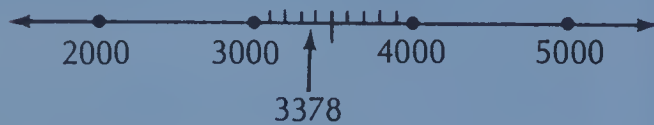
Round to the nearest hundred, thousand, ten thousand, hundred thousand, and million.

Introducing the Lesson

Point out the map of air distances at the top of page 8. Begin a discussion of air travel in Canada. Have the students relate their flying experiences. Explain that we often speak of the distance we travel with **rounded**, rather than **exact** numbers. Ask why we use rounded numbers when we talk about distances travelled.

Teaching the Lesson

Ask the students to find the exact distance between Toronto and Vancouver on the map. Show the students how to round this distance to the nearest thousand. Draw a number line on the chalkboard. Point out that the distance, 3378 km, **rounds down** to 3000 since it is *closer* to 3000 than it is to 4000.



Show another way of looking at rounding. When a number is to be rounded to the nearest thousand, point your pencil to the thousands place. If the number to its right is *5 or more*, increase the number in the thousands place by one and all the digits to its right become zeros. If the number to its right is *less than 5*, the number in the thousands place remains the same and all the digits to its right become zeros.

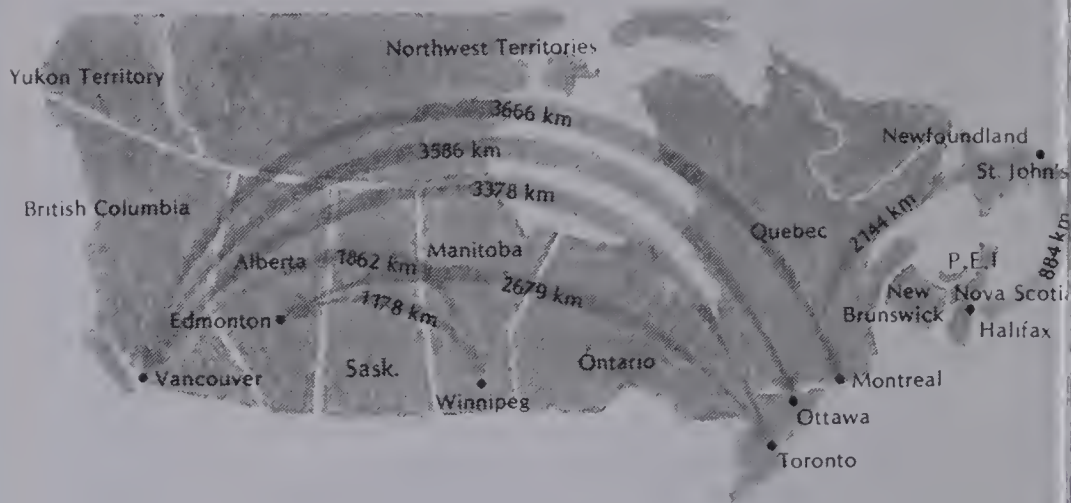
3378 3 is *less than 5*.
 ↑
 3378 rounds down to 3000.

Practise rounding to the nearest thousand also with the air distance from Ottawa to Vancouver.

3586 5 or more
 ↑
 3586 rounds up to 4000.

Have the students practise rounding off several numbers to the nearest hundred, thousand, ten thousand, and million before they begin the developmental exercises.

Rounding Air Distances

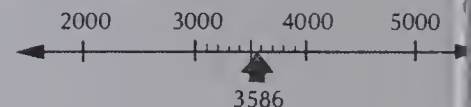


Toronto to Vancouver: 3378 km



3378 rounded to the nearest thousand is 3000.

Ottawa to Vancouver: 3586 km



3586 rounded to the nearest thousand is 4000.

EXERCISES

Round to the nearest hundred.

1. 136 **100** 2. 271 **300** 3. 385 **400** 4. 450 **500** 5. 555 **600**
 6. 2091 **2100** 7. 6781 **6800** 8. 7402 **7400** 9. 59753 **59800** 10. 66738 **66700**

Round to the nearest thousand.

11. 1856 **2000** 12. 3919 **4000** 13. 4432 **4000** 14. 2776 **3000** 15. 6571 **7000**
 16. 62248 **62000** 17. 44218 **44000** 18. 982 **1000** 19. 47819 **48000** 20. 12553 **13000**

Round to the nearest million.

21. 5417243 **5000000** 22. 3875792 **4000000** 23. 70516374 **71000000**
 24. 578476108 **578000000** 25. 91549163 **92000000** 26. 369857113 **370000000**

Using the Exercises

- Questions 1 to 26 require rounding to the nearest hundred, thousand, and million. The first six questions in each group have a bold digit to help the student round to the appropriate place.

PRACTICE

Round to the nearest hundred.

1. 752 800
2. 6831 6800
3. 1075 1100
4. 42 908 43 000
5. 99 100
6. the distance between Winnipeg and Edmonton 1200 km

Round to the nearest thousand.

7. 4172 4000
8. 3690 4000
9. 5521 6000
10. 9999 10 000
11. 48 400 48 000
12. the distance from Montreal to Vancouver 4000 km

Round to the nearest ten thousand.

13. 35 416 40 000
14. 23 779 20 000
15. 155 604 160 000
16. 8 976 358 8 980 000

Round to the nearest hundred thousand.

17. 408 172 400 000
18. 457 190 500 000
19. 5 362 147 5 400 000
20. 32 169 487 32 200 000

Round to the nearest million.

21. 8 752 167 9 000 000
22. 6 179 598 6 000 000
23. 83 946 101 84 000 000
24. 987 412 659 987 000 000

REVIEW

Write in standard form.

1. 300 000 + 700 + 40 300 740
2. 8 000 000 + 90 000 + 2 8 090 002
3. forty-four million three hundred six thousand 44 306 000

Write the place value of the underlined digit.

4. 267 108 412 306 1 hundred million
5. 442 868 106 540 4 hundred billions
6. 185 426 070 135 5 billions
7. 321 175 246 800 7 ten millions

Copy and complete. Use < , = , or > .

8. 7085 ■ 7093 <
9. 65 197 ■ 64 197 >
10. 3294 ■ 3294 =
11. 10 070 000 ■ 9 999 999 >

12. Round 94 372 to the nearest hundred. 94 400
13. Round 23 387 to the nearest thousand. 23 000
14. Round 456 409 to the nearest ten thousand. 460 000
15. Round 507 748 152 to the nearest million. 508 000 000

9

Assigning the Practice

Minimum: even numbers

Average: 1-24

Enriched: 1-24

Review Exercises

Questions	Objective	Pages
1-3	N1	2-3
4-7	N2	4-5
8-11	N3	6-7
12-15	N4	8-9

Reinforcement

1. Ask the students to work the following problems with a calculator and then to round their answers to the nearest thousand.

- a. 658×175
- b. $23\,789 \div 9$
- c. $45\,625 \div 5$
- d. 657×949
- e. 674×867
- f. $118\,768 \div 26$
- g. $182\,160 \div 48$
- h. 338×989

2. Have the students look up the exact distances to cities they would like to travel by air. List these distances on the chalkboard and ask the class to round them to the nearest hundred or thousand.

Enrichment

Ask the students to investigate the area and population of each province and territory. They can list their findings on a chart and round each amount to the nearest thousand. The following questions can then be answered about the chart.

1. How do the provinces and territories rank according to area from largest to smallest?
2. How do the provinces and territories rank according to population from largest to smallest?
3. Do any areas or populations round to the same amount?
4. Does the largest province or territory in area have the largest population?
5. Which has the larger population, the four western provinces or Ontario and Quebec together?

Extra Practice

Worksheet N4

Pages 8-9

Complete the chart.

Round to nearest	hundred	thousand	ten thousand	million
1. 37 108 524	<u>37 108 500</u>	<u>37 109 000</u>	<u>37 110 000</u>	<u>37 000 000</u>
2. 96 813 981	<u>96 814 000</u>	<u>96 814 000</u>	<u>96 810 000</u>	<u>97 000 000</u>
3. 65 521 459	<u>65 521 500</u>	<u>65 521 000</u>	<u>65 520 000</u>	<u>66 000 000</u>
4. 70 908 732	<u>70 908 700</u>	<u>70 909 000</u>	<u>70 910 000</u>	<u>71 000 000</u>
5. 43 255 400	<u>43 255 400</u>	<u>43 255 000</u>	<u>43 260 000</u>	<u>43 000 000</u>
6. 29 967 102	<u>29 967 100</u>	<u>29 967 000</u>	<u>29 970 000</u>	<u>30 000 000</u>
7. 55 853 217	<u>55 853 200</u>	<u>55 853 000</u>	<u>55 850 000</u>	<u>56 000 000</u>
8. 99 129 804	<u>99 129 800</u>	<u>99 130 000</u>	<u>99 130 000</u>	<u>99 000 000</u>
9. 40 007 100	<u>40 007 100</u>	<u>40 007 000</u>	<u>40 010 000</u>	<u>40 000 000</u>
10. 65 416 230	<u>65 416 200</u>	<u>65 416 000</u>	<u>65 420 000</u>	<u>65 000 000</u>

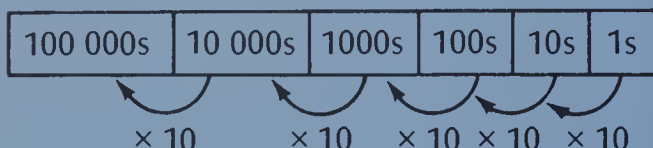
UNIT 1 LESSON 5

Objective N5

Write tenths and hundredths using decimal notation.

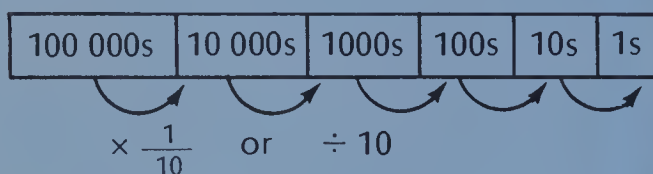
Introducing the Lesson

Review the places in the base ten (or decimal) number system studied so far in this unit by displaying a large place-value chart or drawing one on the chalkboard. Have the students recall that each place to the *left* is 10 times greater than the one to its right.

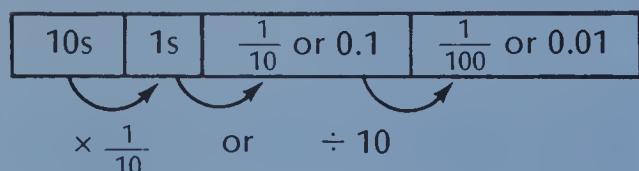


Teaching the Lesson

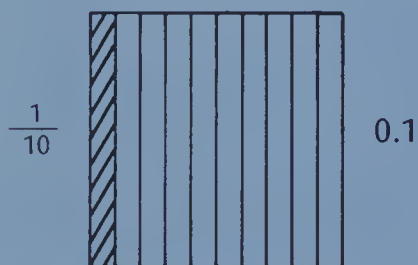
Using the same place-value chart, point out that each place at the *right* is one tenth of the place to its left.



Ask the class, "What place comes at the right of the ones place? Does this pattern of dividing by ten continue?" After receiving an affirmative answer, write on the chalkboard:



Illustrate one whole divided by ten.



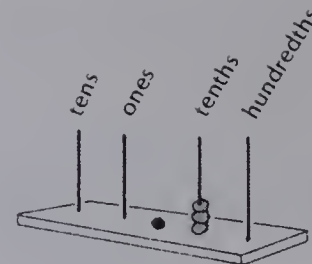
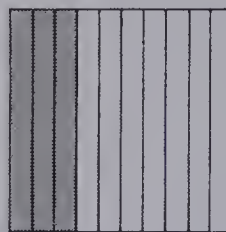
Illustrate a tenth divided by ten.



Point out the examples of tenths and hundredths at the top of page 10. Note the standard and expanded form of numbers with two decimal places.

Tenths and Hundredths

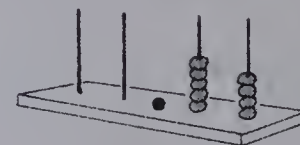
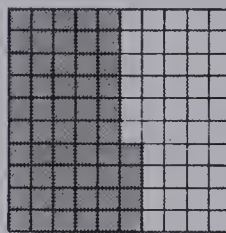
$$\frac{3}{10}$$



Standard form: 0.3

Words: three tenths

$$\frac{54}{100}$$



Standard form: 0.54

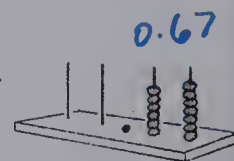
Expanded form: $0.5 + 0.04$

Words: fifty-four hundredths

EXERCISES

Write as a decimal in standard form.

- two tenths **0.2**
- twelve hundredths **0.12**
- eight tenths **0.8**
- sixty-one hundredths **0.61**
- nine tenths **0.9**
- nine hundredths **0.09**



- $\frac{7}{10}$ **0.7**
- $\frac{1}{10}$ **0.1**
- $\frac{59}{100}$ **0.59**
- $\frac{3}{100}$ **0.03**
- $\frac{63}{100}$ **0.63**

Write in words. **six tenths**

- 0.8 **eight tenths**
- 0.6 **one tenth**
- 0.1 **nine hundredths**
- 0.95 **ninety-five hundredths**
- 0.09

Write the decimal in expanded form.

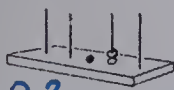


- 0.59 **$0.5 + 0.09$**
- 0.68 **$0.6 + 0.08$**
- 0.39 **$0.3 + 0.09$**
- 0.75 **$0.7 + 0.05$**
- 0.14 **$0.1 + 0.04$**

Using the Exercises

- Questions 1 to 7 require writing the standard form of numbers from words, from fractions, and from an abacus model. See that the students write the necessary zeros in the proper places.
- Questions 13 to 17 involve writing a standard form decimal in words.
- Questions 18 to 22 require that two-place decimals be written in expanded form.

PRACTICE

Write as a decimal in standard form.

1.  0.2
2.  0.49
3.  0.05
4. six tenths 0.6
5. three tenths 0.3
6. eleven hundredths 0.11
7. ninety-eight hundredths 0.98
8. eighteen hundredths 0.18
9. five hundredths 0.05
10. thirty-two hundredths 0.32
11. four tenths 0.4
12. four hundredths 0.04
13. $\frac{6}{10}$ 0.6
14. $\frac{6}{100}$ 0.06
15. $\frac{29}{100}$ 0.29
16. $\frac{8}{10}$ 0.8
17. $\frac{8}{100}$ 0.08

Write in words.

18. 0.4 four tenths
19. 0.9 nine tenths
20. 0.7 seven tenths
21. 0.02 two hundredths
22. 0.16 sixteen hundredths

Write the decimal in expanded form.

23. 0.35 $0.3 + 0.05$
24. 0.78 $0.7 + 0.08$
25. 0.66 $0.6 + 0.06$
26. 0.11 $0.1 + 0.01$
27. 0.94 $0.9 + 0.04$

USING THE CALCULATOR

Divide with a calculator. Do you see the pattern?

$$100 \div 100 = 1$$

$$100 \text{ cm} = 1 \text{ m}$$

$$10 \div 10 = 1$$

$$10 \text{ dm} = 1 \text{ m}$$



- | | |
|---|--|
| a. 42 cm = \blacksquare m <u>0.42</u> | g. 8 dm = \blacksquare m <u>0.8</u> |
| b. 19 cm = \blacksquare m <u>0.19</u> | h. 3 dm = \blacksquare m <u>0.3</u> |
| c. 70 cm = \blacksquare m <u>0.70</u> | |
| d. 7 cm = \blacksquare m <u>0.07</u> | |
| e. 3 cm = \blacksquare m <u>0.03</u> | |
| f. 2 cm = \blacksquare m <u>0.02</u> | |
| | i. 5 cm = \blacksquare dm <u>0.5</u> |
| | j. 9 cm = \blacksquare dm <u>0.9</u> |
| | k. 1 cm = \blacksquare dm <u>0.1</u> |

$$10 \text{ cm} = 1 \text{ dm}$$

one metre



11

Extra Practice

Worksheet N5

Pages 10-11

Write the decimal.



1. $\frac{1}{10}$ 0.1
2. $\frac{3}{10}$ 0.3
3. $\frac{7}{10}$ 0.7
4. $\frac{1}{100}$ 0.01
5. $\frac{47}{100}$ 0.47

6. seventy-two hundredths 0.72
7. nine hundredths 0.09
8. four tenths 0.4
9. thirty hundredths 0.30
10. eight hundredths 0.08
11. fourteen hundredths 0.14

Write in words.

12. 0.9 nine tenths
13. 0.35 thirty-five hundredths
14. 0.70 seventy hundredths
15. 0.07 seven hundredths

Draw a picture of

16. 0.2 
17. 0.45 
18. 0.6 

Assigning the Practice

Minimum: 1-22

Average: 1-24

Enriched: 4-27

Reinforcement

1. Before assigning *Using the Calculator* at the bottom of page 11, see that the students understand the division involved in changing smaller units to larger units. They can use their calculators to complete the equations. After a few calculations, they ought to be able to do the remaining equations mentally.

2. Prepare a worksheet with the following kinds of exercises.

a. Match the digit with the money.

\$0.45 _____ Dollars

_____ Dimes

_____ Pennies

b. Write the place value of each digit.

0.45 0.53

Enrichment

1. Have the students investigate large numbers beyond a hundred million. Ask them to make a chart that illustrates their place in the decimal number system.

2. Ask the students to find the distances between the planets in our solar system. Display their findings on a bulletin board.

3. Prepare a worksheet that asks the following kinds of questions.

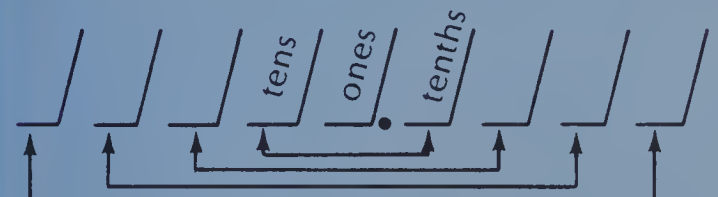
a. What is the place value of the digit 5 in each number?

1. 5222.22 2. 2522.22 3. 52.22

4. 25.22 5. 2.52 6. 2.25

7. 2.225 8. 2.2225 9. 2.222 25

b. What are the missing names in this place-value chart?



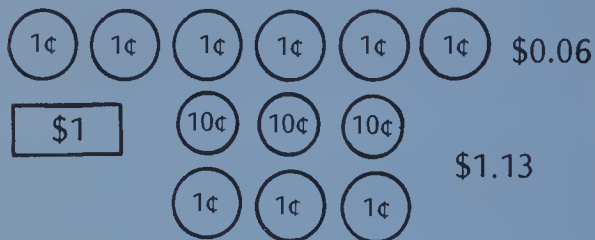
UNIT 1 LESSON 6

Objective N6

Write decimals greater than one.

Introducing the Lesson

Using pennies, dimes, and dollar bills, show several amounts of money less than and more than one dollar.



Point out how the decimal point separates the amounts less than one dollar from the amounts that are one dollar or more. Show how the dollars, dimes, and pennies place is similar to the ones, tenths, and hundredths place.

$\$0.07 = 7$ pennies, or 7 hundredths
 $\$1.13 = 1$ dollar + 1 dime + 3 pennies
 or

1 one + 1 tenth + 3 hundredths

Stress that in reading $\$1.13$, one uses the word “and” at the decimal point.

Teaching the Lesson

Read and discuss the top of page 12. Point out the place value of 4.6 as shown on the abacus. Explain the various ways 4.6 can be written.

1. as a fraction: $\frac{46}{10}$ or $4\frac{6}{10}$

2. expanded form: $4 + 0.6$

3. in words: four *and* six tenths

Note again the use of the word “and”.

Illustrate several decimals greater than one on an abacus. Ask the students to write them in standard form, expanded form, words, and as fractions.

When changing fractions to decimals and vice versa, it would be best to stress:

1. Fractions written as decimals in tenths have only *one* place.

$$\frac{57}{10} = 5.7$$

$$\frac{96}{10} = 9.6$$

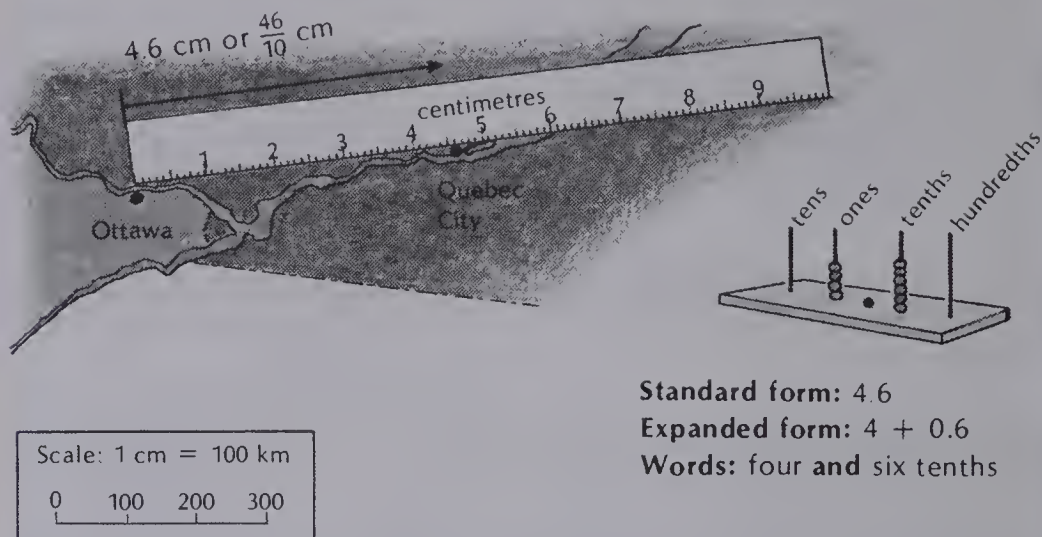
2. Fractions written as decimals in hundredths have only *two* places.

$$\frac{825}{100} = 8.25$$

$$\frac{798}{100} = 7.98$$

Decimals Greater than One

What is the distance between Ottawa and Quebec City?



Standard form: 4.6
 Expanded form: $4 + 0.6$
 Words: four *and* six tenths

The distance between Ottawa and Quebec City is 460 km.

EXERCISES

Write as a decimal in standard form.

1. $5 + 0.7$ **5.7**
2. $30 + 8 + 0.4$ **38.4**
3. $700 + 60 + 5 + 0.9$ **765.9**
4. $8 + 0.3 + 0.05$ **8.35**
5. $9 + 0.1 + 0.01$ **9.11**
6. $40 + 9 + 0.3 + 0.05$ **49.35**
7. three *and* two tenths **3.2**
8. fifteen *and* four tenths **15.4**
9. eighty *and* twelve hundredths **80.12**
10. thirty-eight *and* forty-seven hundredths **38.47**

Write in expanded form.

11. 7.8
12. 12.5
13. 6.17
14. 42.75
15. 376.32

Write as a decimal in standard form.

16. $\frac{23}{10}$ **2.3**
17. $\frac{35}{10}$ **3.5**
18. $\frac{71}{10}$ **7.1**
19. $\frac{429}{100}$ **4.29**
20. $\frac{335}{100}$ **3.35**

Write each amount using numerals, \$, and •.

21. four dollars *and* twelve cents **\$4.12**
22. one dollar *and* one cent **\$1.01**

Using the Exercises

- Questions 1 to 10 require writing standard form decimals from expanded forms and words. The word “and” is in bold letters to stress where the decimal point should go.
- Questions 11 to 15 require writing decimals in expanded form. Several places to the left and right of the decimal point are used.
- Questions 16 to 20 involve changing fractions greater than one to decimals.
- Questions 21 and 22 develop the relationship of the base ten place-value system to the way we write amounts of money greater than one dollar.

PRACTICE

Write as a decimal in standard form.

- $6 + 0.5$ 6.5
- $10 + 3 + 0.8$ 13.8
- $500 + 60 + 2 + 0.3$ 562.3
- $3 + 0.2 + 0.08$ 3.28
- $9 + 0.5 + 0.06$ 9.56
- $20 + 9 + 0.4 + 0.07$ 29.47
- sixty-eight and three tenths 68.3
- five hundred nine and five tenths 509.5
- two and seventy-nine hundredths 2.79
- eight hundred fourteen and five hundredths 814.05

Write in expanded form.

- 2.1
- 32.9
- 156.8
- 3.07
- 403.17

Write as a decimal in standard form.

- $\frac{14}{10}$ 1.4
- $\frac{25}{10}$ 2.5
- $\frac{32}{10}$ 3.2
- $\frac{126}{100}$ 1.26
- $\frac{238}{100}$ 2.38

Write each amount using numerals, \$, and ¢.

- eleven dollars and fifty cents \$11.50
- eleven dollars and five cents \$11.05

Charting the Distance

Find the distances between each pair of cities.

List the distances in a chart.

Scale: 1 cm = 100 km
0 100 200 300



Kilometres	Gaspé	Fredericton	Charlottetown	Sydney	Halifax
Gaspé					
Fredericton					
Charlottetown					
Sydney					
Halifax					

13

Assigning the Practice

Minimum: even numbers

Average: 1-22

Enriched: 1-22

Reinforcement

1. Explain how squares can be used to sketch pictures of decimals and fractions.



$\frac{7}{10}$ or 0.7

Have the students make the following kinds of drawings and answer the corresponding questions.

- Sketch squares to show $\frac{17}{10}$.
Then sketch squares to show 1.7.
How do they compare?
- Sketch squares to show $\frac{23}{10}$.
Then sketch squares to show 2.3.
How do they compare?
- Sketch squares to show $\frac{227}{100}$.
Then sketch squares to show 2.27.
How do they compare?

2. Prepare the following for the students to match.

$\frac{32}{10}$	1.9
$\frac{47}{100}$	7.62
$\frac{19}{10}$	3.2
$\frac{231}{100}$	0.47
$\frac{762}{100}$	2.31

Enrichment

1. Before assigning *Charting the Distance* at the bottom of page 13, review the use of map scales in approximating the distances between cities.

2. Block out a few of the distances between cities on actual road maps and have the students read the scale and measure to approximate the missing distances.

3. Investigate the way foreign countries write money amounts. For example, in Germany four marks and four pfennig are written: 4, 4 DM
A comma instead of a decimal point is used.

Extra Practice

Worksheet N6

Pages 12-13

Write the place value of the underlined digit.

- 3 tens
- 56.6 7 hundredths
- 92.24 2 ones
- 0.8 8 tenths
- 425.81 2 tens
- 156.74 7 tenths

Write the decimal.

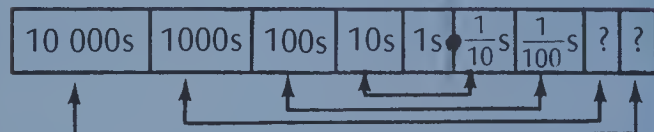
- seven and seventy-two hundredths 7.72
- fourteen and three tenths 14.3
- forty-three and fifty-three hundredths 43.53
- seven tenths 0.7
- six hundred and five hundredths 600.05
- eighty-seven and eighty-seven hundredths 87.87

Objective N7

Write thousandths and ten-thousandths using decimal notation.

Introducing the Lesson

With a chalkboard place-value chart, point out how the places in the base ten (decimal) number system balance on each side of the ones and the decimal point.



Ask, "What would *thousands* balance with?" **Thousands.** "What would ten thousands balance?" **Ten-thousandths.**

Teaching the Lesson

Point out the illustrations at the top of page 14. Show how the 10 cm by 10 cm grid is divided into 1000 equal sections with 27 of these shaded. This represents the fraction $\frac{27}{1000}$, which is 0.027 as a decimal in standard form. Show the place value of 0.027 on the 10 cm by 10 cm grid, also.

0.027

- Since the entire grid is not shaded, there are zero ones.
- Since a 1 cm by 10 cm strip is not shaded, there are zero tenths.
- Since two centimetre squares are shaded, there are two hundredths.
- Since seven 1 mm by 1 cm strips are shaded, there are seven thousandths.

Point out how the 10 cm by 10 cm grid is divided into 10 000 equal sections with 27 of these shaded. This represents the fraction $\frac{27}{10\,000}$ which is 0.0027 as a decimal in standard form. Explain the value of the places in 0.0027 using the grid in the same manner as before.

Illustrate a few three- and four-place decimals on a 10 by 10 grid on the overhead projector or on a place-value abacus.

Thousandths and Ten-Thousandths

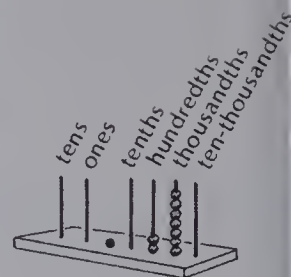
27 out of 1000

Standard form: 0.027

Expanded form: $0 + 0.02 + 0.007$

Words: twenty-seven thousandths

$$\frac{27}{1000}$$



27 out of 10 000

Standard form: 0.0027

Expanded form: $0 + 0.002 + 0.0007$

Words: twenty-seven ten-thousandths

$$\frac{27}{10\,000}$$



EXERCISES

Write as a decimal in standard form.

1. $5 + 0.2 + 0.03 + 0.009$ **5.239**
2. $10 + 4 + 0.3 + 0.08 + 0.002$ **14.382**
3. $1 + 0.06 + 0.005$ **1.065**
4. $300 + 20 + 5 + 0.6 + 0.009$ **325.609**
5. $3 + 0.1 + 0.03 + 0.001 + 0.0004$ **3.1314**
6. $6 + 0.7 + 0.07 + 0.003 + 0.0002$ **6.71002**
7. $10 + 0.5 + 0.006 + 0.0009$ **10.5069**
8. $400 + 5 + 0.02 + 0.008 + 0.0006$ **405.0286**
9. six thousandths **0.006**
10. one hundred one thousandths **0.101**
11. four ten-thousandths **0.0004**
12. thirteen ten-thousandths **0.0013**
13. fifty and three hundred seventy-two thousandths **50.372**
14. two and four thousand six hundred six ten-thousandths **2.4606**
15. $\frac{175}{1000}$ **0.175**
16. $\frac{648}{1000}$ **0.648**
17. $\frac{465}{1000}$ **0.465**
18. $\frac{4265}{10\,000}$ **0.4265**
19. $\frac{9103}{10\,000}$ **0.9103**

Using the Exercises

- Questions 1 to 8 involve the writing of decimals from the expanded form. See that students use place-holder zeros properly.
- Questions 9 to 14 involve the writing of decimals from words. Remind the students that a decimal point is placed where the word "and" appears.
- Questions 15 to 19 involve the writing of decimals from fractions. Remind the students that fractions in thousandths have three decimal places and that fractions in ten-thousandths have four decimal places.

PRACTICE

Write the place value of the underlined digit.

1. 25.126 2. 34.917 3. 6.072 4. 40.1759

2 hundredths 9 tenths 2 thousandths 9 ten thousandths

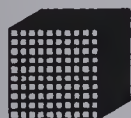
Write as a decimal in standard form.

5. $3 + 0.2 + 0.09 + 0.001$ 3.291
6. $40 + 5 + 0.3 + 0.08 + 0.004$ 45.384
7. $400 + 8 + 0.008$ 408.008
8. $7000 + 20 + 5 + 0.1 + 0.006$ 7025.106
9. $0.7 + 0.08 + 0.007 + 0.0008$ 0.7878
10. $100 + 0.2 + 0.09 + 0.007 + 0.0005$ 100.2975
11. $900 + 8 + 0.005 + 0.0006$ 908.0056
12. $5000 + 100 + 2 + 0.5 + 0.0004$ 5102.5004
13. four thousandths 0.004
14. twelve thousandths 0.012
15. nine ten-thousandths 0.0009
16. sixteen ten-thousandths 0.0016
17. thirty and four hundred two thousandths 30.402
18. six and thirty-nine ten-thousandths 6.0039
19. $\frac{642}{1000}$ 0.642
20. $\frac{8}{1000}$ 0.008
21. $\frac{52}{1000}$ 0.052
22. $\frac{1752}{10\ 000}$ 0.1752
23. $\frac{26}{10\ 000}$ 0.0026

Write in expanded form.

24. 5.872
25. 35.184
26. 9.4278
27. 67.0079

Decimal Patterns



1.0



0.1



0.01



0.001

Write the next four numerals in the pattern.

- a. 0.2, 0.4, 0.6, ■, ■, ■, ■. 0.8, 1.0, 1.2, 1.4
- b. 0.20, 0.17, 0.14, ■, ■, ■, ■. 0.11, 0.08, 0.05, 0.02
- c. 0.001, 0.005, 0.009, ■, ■, ■, ■. 0.013, 0.017, 0.021, 0.025
- d. 0.0001, 0.0003, 0.0005, ■, ■, ■, ■. 0.0007, 0.0009, 0.0011, 0.0013
- e. 0.0039, 0.0033, 0.0027, ■, ■, ■, ■. 0.0021, 0.0015, 0.0009, 0.0003
- f. 62.0106, 62.0207, 62.0308, ■, ■, ■, ■. 62.0409, 62.0510, 62.0611
- g. 147.053, 146.043, 145.033, ■, ■, ■, ■. 144.023, 143.013, 142.003, 140.993

15

Extra Practice

Worksheet N7

Pages 14-15

Write the place value of the 4 in each numeral.

1. 0.435 4 tenths
2. 56.1432 4 hundredths
3. 376.1049 4 thousandths
4. 478.0713 4 hundreds

Write in standard form.

5. $\frac{275}{1000}$ 0.275
6. $\frac{96}{1000}$ 0.096
7. $\frac{2735}{10\ 000}$ 0.2735
8. forty-eight and six thousand five hundred four ten-thousandths 48.6504
9. nine and two hundred eighteen thousandths 9.218
10. three thousand and three thousandths 3000.003

Write in expanded form.

1. 67.0495 $60 + 7 + 0.04 + 0.009 + 0.0005$
2. 3762.4019 $3000 + 700 + 60 + 2 + 0.4 + 0.001 + 0.0009$

Assigning the Practice

Minimum: odd numbers

Average: 1-25

Enriched: 3-27

Reinforcement

1. Before assigning *Decimal Patterns* at the bottom of page 15, show and explain the number block pattern illustrated on the page.

2. Prepare a worksheet asking the students to *sensibly* place the decimal point. Sentences might include:

- a. The price of a new car is \$984657.
- b. The price of a new house is \$9534568.
- c. The height of a baseball player is 202 m.
- d. The mass of an 11 year old boy is 3943 kg.
- e. The thickness of the cover of a math book is 3 m.

Enrichment

Have pairs of students play "Place Value Master Mind". One student writes down a three-place decimal and covers it so his or her partner cannot see it. The partner's task is to reason what the number is with some trial and error. If the guessed digit is in the hidden number, an H (Hit) is written to its side. If the guessed digit is also in the correct place, a B (Bull's eye) is written. Play continues until the hidden number is identified.

0.235 Hidden Number

Guess	Score
1. 0. <u>3</u> 46	H
2. 0. <u>3</u> 62	H H
3. 0. <u>3</u> 26	H H
4. 0. <u>2</u> 63	B H
5. 0.236	B B
6. 0.237	B B
7. 0.235	B B B

This game can also be played with four-place decimals.

Objective N8

Annex zeros to write equivalent decimals.

Introducing the Lesson

Write the following on the chalkboard.

0.5 0.60 0.800

Ask that someone *read* these properly. Practice reading several decimal numbers having zeros.

Teaching the Lesson

Point out the top of page 16. Explain that the shaded part of the grid can be looked at in three ways.

1. Two 1 cm by 10 cm strips are shaded out of ten strips. $\frac{2}{10}$ or 0.2

2. Twenty centimetre squares are shaded out of a hundred squares.

$\frac{20}{100}$ or 0.20

3. Two hundred 1 mm by 1 cm strips are shaded out of a thousand strips.

$\frac{200}{1000}$ or 0.200

Explain that these fractions are

equivalent. $\frac{2}{10} = \frac{20}{100} = \frac{200}{1000}$ Emphasize

that the **decimal equivalents** of these fractions would also be equal: $0.2 = 0.20 = 0.200$. Point out that the zeros to the right of the 2 do not affect the value of the decimal.

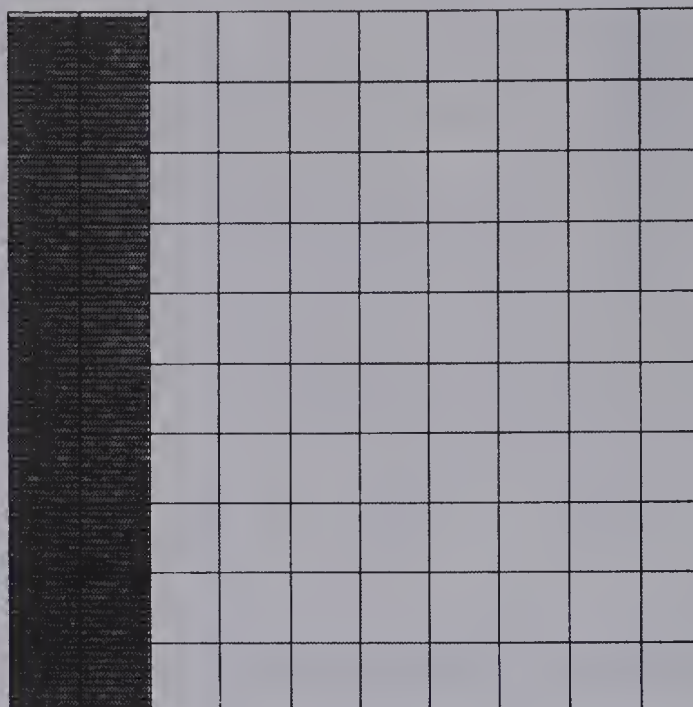
Display other shaded grids that are divided in tenths, hundredths, and thousandths on an overhead projector. Ask the students to name three equivalent fractions and three equivalent decimals for each.

Have the students practise writing an equivalent decimal that requires merely the annexing or removal of zeros at the right.

“An equivalent decimal in tenths to 0.700 is 0.7.”

Ask the students to write two decimals equivalent to 0.40.

Zeros in Decimals



$$\frac{2}{10} = \frac{20}{100} = \frac{200}{1000}$$

0.2 is *equivalent* to 0.20 and 0.200.

Zeros after the last digit of a decimal do not change its value.

EXERCISES

Write an equivalent decimal in tenths.

1. $0.60 = 0. \blacksquare \blacksquare$ **0.6** 2. $1.700 = 1. \blacksquare$ **1.7** 3. $5 = 5. \blacksquare$ **5.0**
4. $0.400 = \blacksquare \blacksquare$ **0.4** 5. $3.200 = \blacksquare$ **3.2** 6. $30.80 = \blacksquare$ **30.8**

Write an equivalent decimal in hundredths.

7. $0.4 = 0. \blacksquare \blacksquare$ **0.40** 8. $3.600 = 3. \blacksquare \blacksquare$ **3.60** 9. $2 = 2. \blacksquare \blacksquare$ **2.00**
10. $0.030 = \blacksquare \blacksquare$ **0.03** 11. $12 = \blacksquare \blacksquare$ **12.00** 12. $6.1 = \blacksquare \blacksquare$ **6.10**

Write an equivalent decimal in thousandths.

13. $3.40 = 3. \blacksquare \blacksquare \blacksquare$ **27.300** 14. $27.3 = 27. \blacksquare \blacksquare \blacksquare$ **9.000** 15. $9 = 9. \blacksquare \blacksquare \blacksquare$ **9.000**
16. $0.3 = \blacksquare \blacksquare \blacksquare$ **3.400** 17. $2.55 = \blacksquare \blacksquare \blacksquare$ **0.300** 18. $62 = \blacksquare \blacksquare \blacksquare$ **2.550** 19. $62 = \blacksquare \blacksquare \blacksquare$ **62.000**

Write true or false.

19. $0.9 = 0.90$ **true** 20. $1.7 = 1.070$ **false** 21. $83 = 83.00$ **true**

Using the Exercises

- Questions 1 to 18 require writing equivalent decimals in tenths, hundredths, and thousandths by either annexing or removing zeros.
- Questions 19 to 21 involve judging if a statement about equivalent decimals is true or false.

PRACTICE

Copy and complete.

1. $0.01 = 0. \blacksquare \blacksquare \blacksquare$ 010
2. $98.6 = 98. \blacksquare \blacksquare$ 60
3. $4 = 4. \blacksquare$ 0
4. $0.700 = 0. \blacksquare$ 7
5. $43.20 = 43. \blacksquare$ 2
6. $69.000 = 69. \blacksquare$ 0
7. $2.9 = 2. \blacksquare \blacksquare \blacksquare$ 900
8. $125.900 = 125. \blacksquare$ 9
9. $8 = 8. \blacksquare \blacksquare$ 00

Write an equivalent decimal in tenths.

10. 7.300 7.3
11. 6.10 6.1
12. 15 15.0
13. 11.8 11.8
14. 42.60 42.6

Write an equivalent decimal in hundredths.

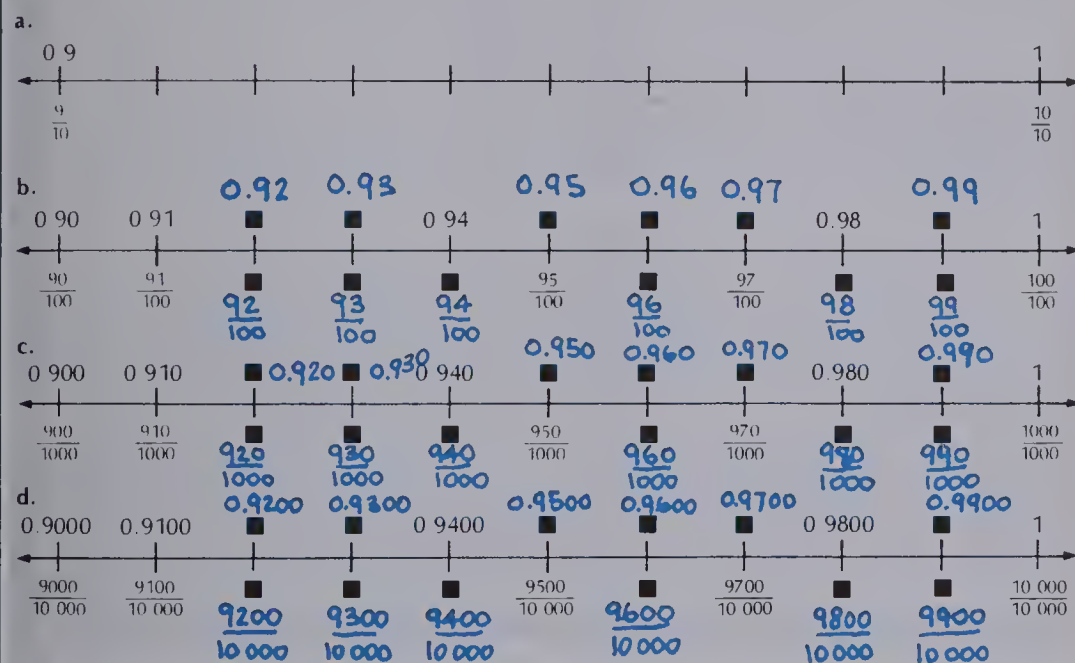
15. 0.030 0.03
16. 17.2 17.20
17. 39 39.00
18. 3.040 3.04
19. 53.1 53.10

Write an equivalent decimal in thousandths.

20. 421.1 421.100
21. 15.44 15.440
22. 9 9.000
23. 4.56 4.560
24. 0.86 0.860

Number Line Patterns

Copy the number lines. Find the patterns. Write the missing numbers.



17

Assigning the Practice

Minimum: 1-24

Average: 1-24

Enriched: 1-24

Reinforcement

1. Assign *Number Line Patterns* at the bottom of page 17. Provide worksheets with predrawn number lines. Stress that all four number lines show what lies between 0.9 and 1.

2. Ask the students to list the equivalent fractions.

0.350	$\frac{7}{10}$	0.500	$\frac{9}{10}$	0.50
$\frac{3}{10}$	0.9	0.5	$\frac{70}{100}$	
0.7	$\frac{900}{1000}$	0.3	$\frac{50}{100}$	0.35
$\frac{5}{10}$	0.700	0.90	$\frac{35}{100}$	$\frac{90}{100}$
0.300	$\frac{30}{100}$	0.900	$\frac{35}{100}$	$\frac{90}{100}$

Enrichment

1. Play a "High, Low, Middle" place-value game.

Materials: 4 sets of numeral cards from 0 to 9 and beans

Rules: Each player is dealt three cards.

Using the digits on the three cards, each player makes up a three-place decimal and writes it down so the others cannot see it. Each player decides whether he or she has constructed the highest, lowest, or middle decimal.

The players reveal their choices and get a bean if their choice was correct. Play continues until all cards are used. The player with the most beans wins.

2. Have the students make a place-value chart that extends beyond the ten-thousandths place and points out the way the places balance on either side of the ones and the decimal point.

Extra Practice

Worksheet N8

Pages 16-17

Write an equivalent decimal in tenths.

1. 0.20 0.2
2. 7.500 7.5
3. 16.90 16.9
4. 0.300 0.3
5. 47 47.0
6. 48.00 48.0

Write an equivalent decimal in hundredths.

7. 3.9 3.90
8. 18 18.00
9. 52.710 52.71
10. 4.350 4.35
11. 0.400 0.40
12. 75.1000 75.10

Write an equivalent decimal in thousandths.

13. 4.6 4.600
14. 7 7.000
15. 64 64.000
16. 7.4000 7.400
17. 0.94 0.940
18. 7.2 7.200

UNIT 1 LESSON 9

Objective N9

Compare decimals using $<$, $=$, or $>$.

Introducing the Lesson

Review the comparison signs:

$<$ is less than

$>$ is greater than

$=$ is equal to

Provide the students with practice in comparing two decimals having the same number of places. Write the following problems on the chalkboard and ask the students to choose the correct comparison sign.

0.5 • 0.9
7.84 • 7.79
16.057 • 16.054

Point out how the digits are compared. For example:

1s	$\frac{1}{10}$ s	$\frac{1}{100}$ s	
7	8	4	$7 = 7$
7	7	9	$0.8 > 0.7$
			so, $7.84 > 7.79$

Note in each case how easy the comparison is when you can compare tenths to tenths, hundredths to hundredths, and thousandths to thousandths.

Teaching the Lesson

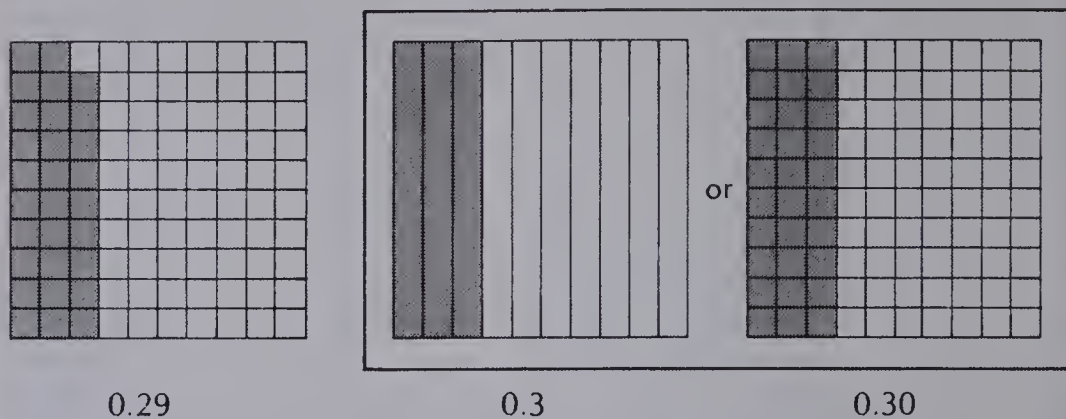
Point out the decimals to be compared at the top of page 18. Explain that one cannot easily compare hundredths to tenths. Discuss the illustrations of 0.29 and 0.3. Note that a decimal equivalent to 0.3 in hundredths is 0.30, which is also pictured. Emphasize that in order to compare the two decimals, they both must be written in hundredths. Hence, 0.3 is written as 0.30. Then 0.29 can be easily compared with 0.30.

1s	$\frac{1}{10}$ s	$\frac{1}{100}$ s	
0	2	9	$0.2 < 0.3$
0	3	0	so, $0.29 < 0.30$

Practise several other comparison examples with tenths, hundredths, and thousandths. Stress the importance of annexing zeros to make the comparisons easier.

Comparing Decimals

Which is greater, 0.29 or 0.3?



We know: $0.29 < 0.30$

So: $0.29 < 0.3$

EXERCISES

Copy and complete. Use $<$ or $>$.

- $2.70 > 2.58$
 $2.7 \blacksquare 2.58$ $>$
- $4.059 < 4.060$
 $4.059 \blacksquare 4.06$ $<$
- $5.10 > 5.09$
 $5.1 \blacksquare 5.09$ $>$
- $17.08 < 17.10$
 $17.08 \blacksquare 17.1$ $<$
- $0.054 > 0.040$
 $0.054 \blacksquare 0.04$ $>$
- $7.9 < 8.0$
 $7.9 \blacksquare 8$ $<$
- $5.24 \blacksquare 5.3$ $<$
- $4.005 \blacksquare 4.02$ $<$
- $2.30 \blacksquare 2.314$ $<$
- $0.3 \blacksquare 0.28$ $>$
- $1.449 \blacksquare 1.5$ $<$
- $22.99 \blacksquare 23.0$ $<$
- $42 \blacksquare 41.16$ $>$
- $0.478 \blacksquare 1$ $<$
- $7 \blacksquare 0.9$ $>$

Write the smallest decimal.

- 3, 0.03, 0.3 0.03
- 4.001, 0.41, 1.004 0.41
- 39.4, 39.399, 39 39
- 15.217, 15.271, 15.712 15.217

Using the Exercises

- Questions 1 to 15 involve comparing two decimals having a different number of places. For Questions 1 to 6 the zeros have already been annexed to make the comparisons easier.
- Questions 16 to 19 require the student to find the smallest decimal in a group of three. Emphasize that each of the three decimals must be written with the same number of places before the smallest decimal can be chosen.

PRACTICE

Copy and complete. Use $<$ or $>$.

1. $4.9 \blacksquare 4.827 >$
2. $16.108 \blacksquare 16.018 >$
3. $9.8 \blacksquare 97 <$
4. $0.13 \blacksquare 0.31 <$
5. $1.0 \blacksquare 0.1 >$
6. $29.02 \blacksquare 29.007 >$
7. $5.261 \blacksquare 5.612 <$
8. $25.060 \blacksquare 26.060 <$
9. $72.6 \blacksquare 72.56 >$
10. $42.4 \blacksquare 42 >$
11. $15.4 \blacksquare 15.399 >$
12. $0.003 \blacksquare 0.030 <$

Write in order starting with the least.

13. 0.03, 0.30, 0.003 0.003, 0.03, 0.30
14. 2.22, 2.02, 2.21 2.02, 2.21, 2.22
15. 0.11, 0.011, 0.10 0.011, 0.10, 0.11
16. 0.311, 0.113, 0.131 0.113, 0.131, 0.311
17. 1.077, 1.7, 1.777 1.077, 1.7, 1.777
18. 4.222, 4.202, 4.232 4.202, 4.222, 4.232
19. 52.1, 52.01, 51 51, 52.01, 52.1
20. 15.057, 15, 15.507 15, 15.057, 15.507

Rocky Mountain Code

Copy and arrange the decimals in order from smallest to largest.
Read the secret message.

4.0	0.150	2.8	0.49	0.44	5	0.51	0.67
D	A	N	F	I	A	U	L

1.74	0.43	0.149	3.9	0.208	0.147	0.74	BEAUTIFUL
A	T	E	A	U	B	C	CANADA



19

Assigning the Practice

Minimum: 1-12

Average: 1-16

Enriched: 5-20

Reinforcement

1. Assign *Rocky Mountain Code* at the bottom of page 19. All students should be able to order the decimals and decode the message without difficulty.

2. Ask the students to write two equivalents for each.

- | | | |
|-------------------|---------------------|---------------------|
| a. $\frac{3}{10}$ | b. 0.4 | c. 0.52 |
| d. 0.372 | e. $\frac{59}{100}$ | f. $\frac{30}{100}$ |
| g. 0.307 | h. $\frac{7}{10}$ | i. 0.34 |

Enrichment

1. Use the two other comparison signs introduced in the Enrichment section of Lesson 3 (\geq "greater than or equal to" and \leq "less than or equal to") and prepare a worksheet with the following questions.

- a. List all decimals counting by 0.01s, > 0.05 but ≤ 0.15 .
- b. List all decimals counting by 0.01s, < 1.0 but ≥ 0.91 .
- c. List all decimals counting by 0.02s, > 0.08 but ≤ 0.20 .
- d. List all decimals counting by 0.6s, < 3.6 but ≥ 0.6 .
- e. List all decimals counting by 0.001s, > 0.027 but ≤ 0.031 .
- f. List all decimals counting by 0.001s, > 0.005 but ≤ 0.010 .
- g. List all decimals counting by 0.01s, < 5.04 but ≥ 4.99 .
- h. List all decimals counting by 0.01s, < 0.12 but ≥ 0.05 .

2. Ask the students to prepare a flow chart (as introduced in Lesson 3 of this unit) showing the steps for comparing two decimals.

Extra Practice

Worksheet N9

Pages 18-19

Complete using $<$ or $>$.

1. $0.4 \underline{>} 0.3$
2. $2.7 \underline{>} 2.65$
3. $1.09 \underline{<} 1.10$
4. $17 \underline{>} 16.995$
5. $0.4 \underline{>} 0.39$
6. $10.004 \underline{<} 10.05$
7. $0.423 \underline{<} 0.5$
8. $4.2 \underline{<} 4.310$
9. $17.08 \underline{>} 17.009$

Write in order starting with the greatest.

0. 0.310, 0.030, 0.33 0.33, 0.310, 0.030
1. 0.40, 0.404, 0.401 0.404, 0.401, 0.40
2. 0.22, 0.022, 0.221 0.221, 0.22, 0.022

Complete.

3. 2.01, 2.02, 2.03, 2.04, 2.05, 2.06, 2.07, 2.08, 2.09, 2.10
4. 0.004, 0.005, 0.006, 0.007, 0.008, 0.009, 0.010, 0.011, 0.012
5. 6.20, 6.21, 6.22, 6.23, 6.24, 6.25, 6.26, 6.27, 6.28, 6.29

UNIT 1 LESSON 10

Objective N10

Round to the nearest whole number, tenth, hundredth, and thousandth.

Introducing the Lesson

Begin a discussion on what *population density* means. Since it is figured on the basis of the average number of people living in *one square kilometre*, help the class visualize the size of such a square. (See Introducing the Lesson for Lesson 1.) Point out the information on Canada and China at the top of page 20. Note how similar the two countries are in size, but how different they are in population density.

Teaching the Lesson


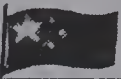
Take a closer look at the population densities of Canada and China. Point out that since the numbers represent people, they would be best understood after being **rounded** to the nearest whole number. Explain the rounding process on a number line as shown on page 20. Point out that Canada's population density rounds up to 3, since it is closer to 3 than it is to 2.

Write 455.866 (China's population density) on the chalkboard. Explain that in rounding it to the nearest whole number, one would place the pencil on the number in the ones place. Since the number to the right is **5 or more**, the number in the ones place is increased by one.

455.866
↑
8 is 5 or more.
So, 455.866 rounds up to 456.

Continue this procedure as you give the students practice in rounding to the nearest tenth, hundredth, and thousandth.

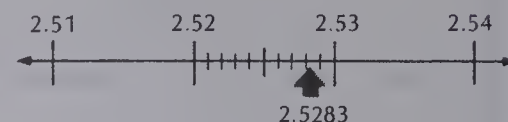
Rounding Decimals

	Canada 	China 
Population	23 597 600	958 230 000
Area (km ²)	9 979 000 km ²	9 563 000 km ²
Population density per square kilometre	2.5283	455.866

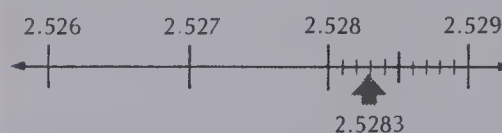
2.5283 rounded to the nearest tenth is 2.5.



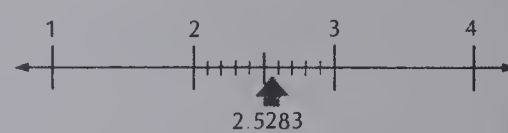
2.5283 rounded to the nearest hundredth is 2.53.



2.5283 rounded to the nearest thousandth is 2.528.



2.5283 rounded to the nearest whole number is 3.



EXERCISES

Round to the nearest tenth.

1. 0.71 **0.7** 2. 3.08 **3.1** 3. 0.15 **0.2** 4. 3.666 **3.7** 5. 5.24 **5.2**

Round to the nearest hundredth.

6. 0.143 **0.14** 7. 4.158 **4.16** 8. 0.655 **0.66** 9. 6.121 **6.12** 10. 9.889 **9.89**

Round to the nearest thousandth.

11. 0.1172 **0.117** 12. 1.5789 **1.579** 13. 0.0155 **0.016** 14. 3.4213 **3.421** 15. 2.6796 **2.680**

Round to the nearest whole number.

16. 8.4 **8** 17. 3.68 **4** 18. 12.531 **13** 19. 0.286 **0** 20. 4.71 **5**

20

Using the Exercises

- Questions 1 to 20 require rounding to the nearest tenth, hundredth, thousandth, and whole number. The first three questions in each group have a bold digit to help the student round to the appropriate place.

PRACTICE

Copy and complete the chart.

Round these numerals.	to the nearest tenth.	to the nearest hundredth.	to the nearest thousandth.	to the nearest whole number.
1. 0.9572	1.0	0.96	0.957	1
2. 4.0971	4.1	4.10	4.097	4
3. 3.8465	3.8	3.85	3.847	4
4. 10.7059	10.7	10.71	10.706	11
5. 15.1584	15.2	15.16	15.158	15
6. 16.7815	16.8	16.78	16.782	17

REVIEW

Write as a decimal.

- N5 1. nine tenths 0.9 2. thirty-seven hundredths 0.37 3. six hundredths 0.06
- N6 4. $6 + 0.5$ 6.5 5. $400 + 3 + 0.5 + 0.08$ 403.58 6. $90 + 0.1 + 0.02$ 90.12
- N7 7. $3 + 0.5 + 0.02 + 0.003 + 0.0006$ 3.5236
8. $10 + 2 + 0.9 + 0.005 + 0.0008$ 12.9058
- N8 Write an equivalent decimal in hundredths.
9. 6.3 6.30 10. 15 15.00 11. 98.930 98.93 12. 26.700 26.70
- N9 Copy and complete. Use $<$ or $>$.
13. 5.2 > 5.02 14. 36.91 < 36.917 15. 42 > 41.9
- N10 16. Round 4.62 to the nearest whole number. 5
17. Round 306.15 to the nearest tenth. 306.2
18. Round 7.5062 to the nearest hundredth. 7.51
19. Round 35.1784 to the nearest thousandth. 35.178

21

Assigning the Practice

Minimum: 1-6

Average: 1-6

Enriched: 1-6

Review Exercises

Questions	Objective	Pages
1-3	N5	10-11
4-6	N6	12-13
7-8	N7	14-15
9-12	N8	16-17
13-15	N9	18-19
16-19	N10	20-21

Reinforcement

1. Ask the students to round the population densities of the following countries to the nearest tenth. (The rounded figures are used in the next lesson of this unit.)

Country	Population density
France	97.1021
Japan	306.1134
Russia	11.5491
United States	23.1291

2. Ask the students to explain in writing why:

- 50.9 rounds to 51.
- 50.4 rounds to 50.
- 50.46 rounds to 50.
- 50.44 rounds to 50.

Enrichment

1. With an odometer, help the students map out one square kilometre in the school's vicinity. Encourage bicycle travel around it to get the feeling of 1 km².

2. Ask the class to make a line graph of the population densities given in this lesson.

3. Ask the students to list the numbers that can be rounded to the number in the underlined place. For example:

40

The numbers 35 to 44 can be rounded to 40.

- 20
- 70
- 360
- 5000
- 1400
- 30 000 000

Extra Practice

Worksheet N10

Pages 20-21

Complete the table.

Round to nearest	tenth	hundredth	thousandth	whole number
1. 4.0999	4.1	4.10	4.100	4
2. 26.1387	26.1	26.14	26.139	26
3. 8.7562	8.8	8.76	8.756	9
4. 0.0079	0.0	0.01	0.008	0
5. 23.8448	23.8	23.84	23.845	24
6. 5.9142	5.9	5.91	5.914	6
7. 9.9999	10.0	10.00	10.000	10
8. 30.1255	30.1	30.13	30.126	30

UNIT 1 LESSON 11

Objective PS1

Read and interpret charts to solve comparison and ordering problems.

Introducing the Lesson

Discuss with the class the value of charts. Point out that a lot of information can be clearly stated and compared in a chart.

Divide the class into four random groups. Make a chart on the chalkboard similar to the one below, which gives information about how the students come to school.

Students	walk to school.	take the bus to school.	ride a bike to school.	are driven to school.
group 1	4	3	0	1
group 2	1	0	2	5
group 3	3	1	1	3
group 4	2	2	2	2

Discuss the information given in the chart.

Teaching the Lesson

Point out the chart with information about six countries on page 22. Ask the students several questions about the information in the chart to be sure they understand it correctly.

"What is the area of the United States?"

"Which country has the largest area?"

"What is the population of France?"

"In which country does the greatest number of people live?"

"Which country is the most (least) crowded?"

Enrichment

1. Encourage the students to investigate the populations, areas, and population densities of other countries. This information can be charted and displayed.

2. Have the students make bar or line graphs of the population chart information on page 22.

3. Cut out and display examples of information charts printed in newspapers and magazines.

Reading Charts



Country	Population	Area (km ²)	Population density per square kilometre
Canada	23 579 600	9 979 000	2.5
China	958 230 000	9 563 000	455.9
France	53 280 000	547 000	97.1
Japan	114 900 000	372 000	306.1
Russia	258 930 000	22 402 000	11.5
United States	219 484 000	9 366 000	23.1

EXERCISES

- List the countries in order from greatest to least:
 - according to population **2,5,6,4,3,1**
 - according to area **5,1,2,6,3,4**
- Which country has fewer people per square kilometre than Canada? **none**
- Which country has the most people per square kilometre? **China**
- Does the United States or France have more people per square kilometre? **France**
- Round each "population per square kilometre" to the nearest whole number. List these densities in order from least to greatest.

22

Post-test

Unit

Write in expanded form.

- 65 479 **60 000 + 5 000 + 400 + 70 + 9**
- 7 509 147 **7 000 000 + 500 000 + 90 000 + 100 + 40 + 7**
- 679 003 402 **600 000 000 + 70 000 000 + 9 000 000 + 30 000 + 400 + 2**

Write in standard form.

- ninety million six thousand **90 006 000**
- twenty-one billion two hundred four **21 000 000 204**
- four hundred billion two hundred million four hundred **400 200 000 400**

Write the place value of the underlined digit.

- 294 106 217 621 **1 hundred million**
- 869 135 426 372 **9 billions**
- 308 427 552 495 **3 hundred billions**
- 980 486 349 098 **8 ten billions**

Complete using < or >.

- 91 064 **>** 91 046
- 71 864 **>** 71 863

UNIT 1

TEST

Write in expanded form.

1. 24 109 $20\,000 + 4\,000 + 100 + 9$
 2. 6 251 374 $6\,000\,000 + 200\,000 + 50\,000 + 1\,000 + 300 + 70 + 4$
 3. 59 482 400 $50\,000\,000 + 9\,000\,000 + 400\,000 + 80\,000 + 2\,000 + 400$

Write in standard form.

4. forty-three million sixty-two thousand 43 062 000
 5. five billion five thousand five 5 000 005 005
 6. one hundred sixty-one billion two hundred six million 161 206 000 000

Write the place value of the underlined digit.

7. 7 3 46 108 925 3 hundred millions
 8. 62 759 162 448 6 ten billions
 9. 6 425 679 048 6 billions
 10. 9 02 000 402 000 9 hundred billions

Copy and complete. Use <, =, or >.

11. 39 486 \square 39 386 >
 12. 999 999 \square 8 000 000 <
 13. Round 65 275 to the nearest thousand. 65 000
 14. Round 4 098 695 to the nearest hundred thousand. 4 100 000
 15. Round 57 314 602 to the nearest million. 57 000 000

Write as a decimal in standard form.

16. $0.5 + 0.09$ 0.59
 17. $40 + 6 + 0.2 + 0.06$ 46.26
 18. $3 + 0.4 + 0.05 + 0.002$ 3.452
 19. $0.09 + 0.008 + 0.0004$ 0.0984
 20. five and twenty-one hundredths 5.21
 21. five and seventy-five hundredths 5.75
 22. eleven and four tenths 11.4
 23. $\frac{7}{10}$ 0.7
 24. $\frac{27}{10}$ 2.7
 25. $\frac{16}{100}$ 0.16
 26. $\frac{5}{1000}$ 0.005
 27. $\frac{8}{10\,000}$ 0.0008

Copy and complete.

28. $0.4 = 0.\square\square$ 0.40
 29. $7.\square\square\square = 7.3$ 7.300
 30. $42.09 = 42.\square\square\square$ 42.090

Copy and complete. Use < or >.

31. $5.04 \square 5.4$ <
 32. $4.2 \square 4.199$ >
 33. $28.006 \square 28.01$ <
 34. Round 16.5731 to the nearest tenth. 16.6
 35. Round 5.7431 to the nearest hundredth. 5.74
 36. Round 0.8685 to the nearest thousandth. 0.869

23

Unit 1 Objective	Test Questions	Pages
N1	1-4	2-3
N2	5-10	4-5
N3	11, 12	6-7
N4	13-15	8-9
N5	16, 21, 23-25	10-11
N6	17, 20-22	12-13
N7	18, 19, 26, 27	14-15
N8	28-30	16-17
N9	31-33	18-19
N10	34-36	20-21

und 5 716 048 to the nearest

thousand 5 716 000 14. ten thousand 5 720 000 15. million 6 000 000

rite as a decimal in standard form.

- $0.2 + 0.04$ 0.24
 $70 + 5 + 0.6 + 0.08$ 75.68
 $8 + 0.7 + 0.08 + 0.006$ 8.786
 $0.05 + 0.009 + 0.0001$ 0.0591
 fourteen and nineteen hundredths 14.19
 six and two hundredths 6.02
 22. fifty-seven and four tenths 57.4

- $\frac{6}{10}$ 0.6
 24. $\frac{81}{10}$ 8.1
 25. $\frac{8}{100}$ 0.08
 26. $\frac{12}{1000}$ 0.012
 27. $\frac{9}{10\,000}$ 0.0009

mplete.

- $0.2 = 0.\underline{2}\underline{0}\underline{0}$
 29. $4.\underline{9}\underline{0} = 4.9$
 30. $7.06 = 7.\underline{0}\underline{6}\underline{0}$

mplete using < or >.

- $7.08 \underline{<} 7.1$
 32. $3 \underline{>} 2.9999$
 33. $56.97 \underline{<} 56.978$

und 6.7961 to the nearest

tenth. 6.8 35. hundredth. 6.80 36. thousandth. 6.796

Problem Solving Activities

Assign Level 6, Unit 1

UNIT 2

Addition and Subtraction

Theme: Travel

Lesson		Objective	Pages
Preview		Recall addition and subtraction facts to 9.	25
1	A1	Add two- and three-digit numbers.	26-27
2	A2	Add four-digit and five-digit numbers.	28-29
3	M1	Add with money.	30-31
4	A3	Add tenths, hundredths, and thousandths.	32-33
5	A4	Add more than two addends.	34-35
6	A5	Subtract two- and three-digit numbers.	36-37
7	A6	Subtract four- and five-digit numbers.	38-39
8	M2	Subtract with money.	40-41
9	A7	Subtract tenths, hundredths, and thousandths.	42-43
10	PS2	Recognize words and phrases associated with addition and subtraction in word problems.	44-45
Test		Addition and subtraction	46
Review		Place value	47

About This Unit

The purpose of this unit is to:

1. review and develop addition and subtraction skills with whole numbers with up to five digits and decimals with up to three places;
2. develop an understanding of the properties related to addition and subtraction;
3. review and extend rounding and estimating skills;
4. develop skills in comparing sums and differences;
5. apply addition and subtraction skills to money numbers and other problem situations.

In order for the students to use and understand the addition and subtraction algorithms, they must have a firm understanding of the following facets of addition and subtraction.

1. *Basic meaning*

Addition is associated with the act of putting things together; subtraction is associated with separating or comparing sets of things.

2. *Properties*

Addition is commutative,
 $a + b = b + a$.

Addition is associative,
 $(a + b) + c = a + (b + c)$.

Subtraction is not commutative,
 $(a - b) \neq b - a$.

Subtraction is not associative,
 $(a - b) - c \neq a - (b - c)$.

Zero is the additive identity element,
 $0 + a = a$.

The student will not be required to give a formal explanation of these properties, but will need to have a practical understanding of them.

For example:

- a. $5 + 3 = 3 + 5$ (commutative)
- b. $(6 + 2) + 7 = 6 + (2 + 7)$ (associative)
- c. $8 - 3 \neq 3 - 8$ (not commutative)
- d. $(10 - 7) - 3 \neq 10 - (7 - 3)$ (not associative)
- e. $0 + 4 = 4$, $9 + 0 = 9$ (additive identity element)

3. *Basic facts*

4. *Place value*

An understanding of place value is the most important factor in learning and using the addition and subtraction algorithms. Hence, continuous use of place-value activities may be necessary.

The development of the addition and subtraction algorithms in this unit will be built on the above four items; however, the topics used will grow out of real-life problem situations.

Ideas

Ask students to bring in clippings from travel magazines or the travel section from the newspaper for the bulletin board. Have the class create problems based on the articles and advertisements. Look for material appropriate to the objectives of each lesson and start the class with a discussion of the material, generating a math problem.

UNIT 2

ADDITION & SUBTRACTION



Unit 2 Objective	Test Questions	Pages
A1	1-4	26-27
A2	5-8	28-29
M1	9-12	30-31
A3	13-16	32-33
A4	17-18	34-35
A5	19-20	36-37
A6	21-24	38-39
M2	25-26	40-41
A7	27-30	42-43
PS	31	

Pretest

Find the sum.

1. $\begin{array}{r} 263 \\ + 74 \\ \hline 337 \end{array}$	2. $\begin{array}{r} 247 \\ + 956 \\ \hline 1203 \end{array}$	3. $\begin{array}{r} 129 \\ + 938 \\ \hline 1067 \end{array}$	Unit 2
5. $\begin{array}{r} 6745 \\ + 384 \\ \hline 7129 \end{array}$	6. $\begin{array}{r} 71\,324 \\ + 9\,758 \\ \hline 81\,082 \end{array}$	7. $\begin{array}{r} 68\,954 \\ + 37\,819 \\ \hline 106\,773 \end{array}$	4. $\begin{array}{r} 647 \\ 23 \\ + 815 \\ \hline 1485 \end{array}$
9. $\begin{array}{r} \$7.25 \\ + 0.89 \\ \hline \$8.14 \end{array}$	10. $\begin{array}{r} \$75.76 \\ + 19.18 \\ \hline \$94.94 \end{array}$	11. $\begin{array}{r} \$73.26 \\ 1.95 \\ + 42.82 \\ \hline \$118.03 \end{array}$	8. $\begin{array}{r} 41\,657 \\ 86 \\ + 9\,218 \\ \hline 50\,961 \end{array}$
13. $\begin{array}{r} 5.27 \\ + 4.8 \\ \hline 10.07 \end{array}$	14. $\begin{array}{r} 32.8 \\ + 7.324 \\ \hline 40.124 \end{array}$	15. $\begin{array}{r} 9.8 \\ 24.63 \\ + 8.297 \\ \hline 42.727 \end{array}$	12. $\begin{array}{r} \$35.62 \\ 8.47 \\ + 73.87 \\ \hline \$117.96 \end{array}$
			16. $\begin{array}{r} 0.87 \\ 0.6 \\ + 0.759 \\ \hline 2.229 \end{array}$

Crack the Code

Replace each letter with a number to make the equation true.
Use the letters to decode the message.

T R A V E L I N C A N A D A
 ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
 16 15 14 9 8 5 13 6 17 14 6 14 7 14



25

UNIT 2 PREVIEW

Suggestions

Display a large map of Canada and initiate a discussion of the students' experiences with Canadian travel. Locate the places they mention on the map. Have the students estimate distances and times.

Use a map of the Western Hemisphere or of the world to elicit travel experiences of the students outside of Canada.

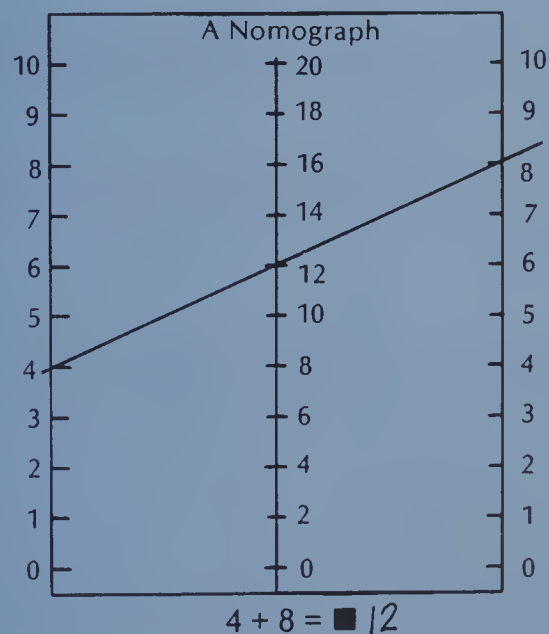
Encourage the students to bring in photographs, maps, or brochures of places to which they have travelled. Make a bulletin board of these materials.

About the Page

All the students should attempt to find the values of the letters in the equations on page 25. The equations review basic addition and subtraction facts. Once the letter values are determined, the students can decode the message. This provides a means for self-checking each response.

Reinforcement

Guide the students in making a nomograph. Ask the students to show various unanswered addition and subtraction questions with the nomograph.



The straightedge lines up the 4 and the 8 to show that their sum is 12.

$$12 - 4 = 8$$

The straightedge also lines up the 4 and 12 to show that their difference is 8.

$$47 + 9 + 425 + 62 = 543 \quad 18. \quad 6.7 + 53 + 9.05 + 4.876 + 8 = 81.626$$

Find the difference.

324	20. 408	21. 9016	22. 8943
- 95	- 179	- 625	- 1275
<u>229</u>	<u>229</u>	<u>8391</u>	<u>7668</u>
60 102	24. 90 001	25. \$2.71	26. \$70.00
- 8 519	- 37 152	- 1.85	- 35.98
<u>51 583</u>	<u>52 849</u>	<u>\$0.86</u>	<u>\$34.02</u>

Subtract. Check by adding.

3.7	28. 5.3	29. 47.0	30. 9.0
- 2.9	- 0.38	- 0.865	- 0.85
<u>0.8</u>	<u>4.92</u>	<u>46.135</u>	<u>8.15</u>

Find the difference.

Suppose you spent \$10.95 on a belt and \$8.95 on a T-shirt. How much change would you get from \$20.00? **10¢**

UNIT 2 LESSON 1

Objective A1

Add two- and three-digit numbers.

Introducing the Lesson

Begin a discussion of the Calgary Stampede. Allow the students to describe their experiences.

Estimate the distance between your city or town and Calgary using a wall map.

Teaching the Lesson

Point out the example at the top of page 26. Recall that addition is needed to find the total distance travelled. Discuss the addition example shown on the student page. Remind the students that when adding two- or three-digit numbers, the ones are added first. Provide more practice with the following examples of car trips to Calgary.

Trip 1 Prince George to Calgary

Prince George, B.C., to Jasper — 346 km
Jasper, Alta., to Calgary, Alta. — 415 km

	Add ones.	Add tens.	Add hundreds.
	1	1	1
346	346	346	346
+415	+415	+415	+415
	1	61	761

Total distance = 761 km

Trip 2 Flin Flon to Calgary

Flin Flon to Prince Albert, Sask. — 449 km
Prince Albert to Saskatoon — 164 km
Saskatoon, Sask., to Calgary — 620 km

Write a few addition problems *horizontally* on the chalkboard. Ask the students to write them vertically before finding the *sum*. Check that the students line up the digits in the ones, tens, and hundreds places properly.

Point out that the *order* of the addends can be changed without affecting the sum. For example:

$$79 + 85 = 85 + 79$$

$$192 + 63 + 8 = 192 + 8 + 63$$

(The students should be aware of the concept of commutativity of addition at this time without being held responsible for knowing the term.)

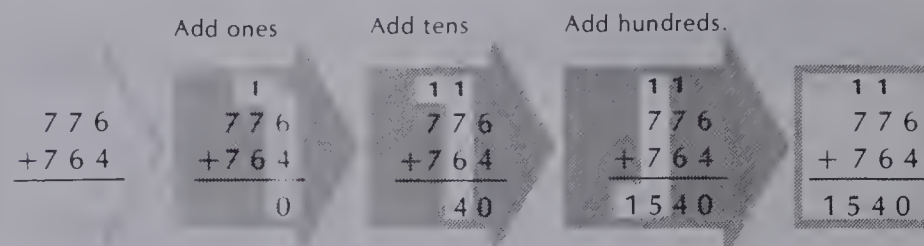
Two- and Three-Place Addition

Sonia's family drove to the Calgary Stampede on their summer holidays. On the first day, they drove 776 km from Kenora, Ontario, to Regina, Saskatchewan. On the second day, they drove 764 km from Regina to Calgary.



What was the total distance they travelled?

$$776 + 764 = \blacksquare$$



Sonia's family travelled 1540 km to the Calgary Stampede.

EXERCISES

Find the sum.

- $53 + 44 = 97$
- $635 + 19 = 654$
- $795 + 23 = 818$
- $856 + 64 = 920$
- $534 + 646 = 1180$
- $381 + 175 = 556$
- $264 + 13 + 122 = 399$
- $35 + 132 + 463 = 630$

Find the sum.

- $943 + 72 = 1015$
- $657 + 195 = 852$
- $750 + 250 + 29 = 1029$
- $540 + 360 + 96 = 996$
- $625 + 38 + 175 = 838$
- $397 + 103 + 45 = 545$

Copy and complete each equation.

- $24 + \blacksquare = 69 + 24$
- $\blacksquare + 98 = 98 + 87$
- $231 + 69 = \blacksquare + 231$
- $564 + 918 = 918 + \blacksquare$

Using the Exercises

- Questions 1 to 14 give practice in adding two and three addends with regrouping. For all questions, especially 9 to 14, check that the students line up the digits properly. Anyone having difficulty with these problems should receive more practice with basic facts and with problems having only two addends.
- For Questions 15 to 18 stress the value of the equals sign as the students complete the equations. The concept is the commutativity of addition, but the students need not name the property at this time.

PRACTICE

Find the sum.

1. $\begin{array}{r} 76 \\ + 43 \\ \hline 119 \end{array}$
2. $\begin{array}{r} 319 \\ + 42 \\ \hline 361 \end{array}$
3. $\begin{array}{r} 753 \\ + 56 \\ \hline 809 \end{array}$
4. $\begin{array}{r} 477 \\ + 33 \\ \hline 510 \end{array}$
5. $\begin{array}{r} 39 \\ + 982 \\ \hline 1021 \end{array}$
6. $\begin{array}{r} 752 \\ + 839 \\ \hline 1591 \end{array}$
7. $\begin{array}{r} 979 \\ + 868 \\ \hline 1847 \end{array}$
8. $\begin{array}{r} 575 \\ 12 \\ + 431 \\ \hline 1018 \end{array}$
9. $\begin{array}{r} 864 \\ 783 \\ + 596 \\ \hline 2243 \end{array}$
10. $\begin{array}{r} 777 \\ 889 \\ + 999 \\ \hline 2665 \end{array}$

Find the sum.

11. $42 + 138 = 180$
12. $837 + 906 = 1743$
13. $570 + 30 + 962 = 1562$
14. $12 + 188 + 35 = 235$
15. $110 + 605 + 190 = 905$
16. $495 + 387 + 13 = 895$

Copy and complete each equation.

17. $64 + 123 = \blacksquare + 64$
 $\quad \quad \quad 123$
18. $148 + \blacksquare = 25 + 148$
 $\quad \quad \quad 25$

Copy and complete. Use $<$, $=$, or $>$.

19. $617 + 38 \bullet 334 + 321$
 $\quad \quad \quad =$
20. $576 + 97 \bullet 217 + 468$
 $\quad \quad \quad <$

Solve.

21. Make the largest possible 3-digit number using the digits 4, 2, and 6. Add this to the largest 3-digit number that can be made using 5, 7, and 3.
 $\quad \quad \quad 642$
 $\quad \quad \quad 753$
 $\quad \quad \quad 1395$

Addition Short Cut

Study the sample problems. Find the addition short cut. Do the other problems mentally. Write down only the answers.

$$\begin{array}{r} 196 + 157 \\ \hline 200 + 153 = 353 \end{array} \quad \begin{array}{r} 308 + 176 \\ \hline 300 + 184 = 484 \end{array}$$

- a. $297 + 654 = \blacksquare$ 951
- b. $591 + 472 = \blacksquare$ 1063
- c. $675 + 341 = \blacksquare$ 1016
- d. $785 + 622 = \blacksquare$ 1407
- e. $481 + 511 = \blacksquare$ 992
- f. $497 + 435 = \blacksquare$ 932

27

Assigning the Practice

Minimum: 1-18

Average: 1-21

Enriched: 1-21

Reinforcement

1. Have pairs of students make up the following set of numbered cards for an addition card game.

1 2 3 4 5 6 7 8 9

The first player shuffles the cards and deals them from right to left making three three-digit numbers (one above the other). The same player then adds.

$$\begin{array}{r} \begin{array}{|c|c|c|} \hline 6 & 3 & 9 \\ \hline \end{array} & 639 \\ \begin{array}{|c|c|c|} \hline 7 & 5 & 4 \\ \hline \end{array} & 754 \\ \begin{array}{|c|c|c|} \hline 8 & 1 & 2 \\ \hline \end{array} & +812 \\ \hline & 2205 \end{array}$$

One point is scored for each zero in the sum. In the above example there is one zero, so the player scores one.

Play continues with each player shuffling, dealing, and adding. The player who first scores 8 (or 10) points wins.

2. Ask the students to find the numbers that make the following additions correct.

$$\begin{array}{r} \quad \quad \quad 2 \quad \quad \quad 4 \quad \quad \quad 8 \\ 2\blacksquare 9 \quad 3\blacksquare 9 \quad 3\blacksquare 8 \quad 4\blacksquare 7 \\ +3\blacksquare 9 \quad +44\blacksquare 7 \quad +43\blacksquare 7 \quad +22\blacksquare 5 \\ \hline 68 \quad 776 \quad 785 \quad 7\blacksquare 12 \end{array}$$

Enrichment

1. Before assigning *Addition Short Cut* at the bottom of page 27, read and discuss the examples given. Write other examples on the chalkboard and gradually have the students find the sums mentally.

2. Display a map of Canada along with its kilometre guide showing distances between cities. Ask the students to write out suggestions for car trips between cities on stiff cards. Post the cards in the classroom to be used by the rest of the class to find the total distance travelled in each trip.

Extra Practice

Worksheet A1

Pages 26-27

Find the sum.

1. $\begin{array}{r} 483 \\ + 897 \\ \hline 1380 \end{array}$
2. $\begin{array}{r} 25 \\ 9 \\ + 647 \\ \hline 681 \end{array}$
3. $\begin{array}{r} 375 \\ 87 \\ + 845 \\ \hline 1307 \end{array}$
4. $\begin{array}{r} 6 \\ 27 \\ + 998 \\ \hline 1031 \end{array}$

5. $36 + 127 + 9 = 172$
6. $84 + 3 + 726 = 813$

Round to the nearest hundred. Write the estimated sum.

7. $229 + 683 + 107 =$
 $200 + 700 + 100 = 1000$
8. $812 + 260 + 247 =$
 $800 + 300 + 200 = 1300$

Solve.

9. The distance between Montreal and Ottawa is 558 km. What is the total distance travelled on a round trip?
 1116 km

UNIT 2 LESSON 2

Objective A2

Add four- and five-digit numbers.

Introducing the Lesson

Discuss travel experiences the students have had to places outside of Canada. Focus particularly on trips to far-away places.

Have the students estimate the air distances travelled to these far-away places after showing them on a map.

Teaching the Lesson

Point out the trip of the Winnipeg family given in the problem at the top of page 28. Discuss each step of the addition example, stressing that the ones are added first. Write the following trips on the chalkboard and show the routes on a map. Have the class compute the total air distance travelled for each. Check their work, noting their use of the proper method (starting with the ones), number alignment, and knowledge of basic facts.

Trip 1 Edmonton to Barbados

Edmonton, Alta., to Toronto 11
Toronto, Ont., to Barbados 2679 km
Toronto, Ont., to Barbados +3980 km
Total air distance 6659 km

Trip 2 Gander to Houston

Gander, Nfld., to Toronto 22
Toronto, Ont., to Dallas, Tex. 1989 km
Dallas, Tex., to Houston, Tex. 1984 km
Dallas, Tex., to Houston, Tex. + 328 km
Total air distance 4301 km

Trip 3 Winnipeg to Moscow

Winnipeg, Man., to Montreal 111
Montreal, Que., to Moscow 1796 km
Montreal, Que., to Moscow +6996 km
Total air distance 8792 km

Discuss the meaning of a "round trip". Have the students use the air distances already mentioned to estimate the round trip air distance between two cities. They can then check their estimates by computation.

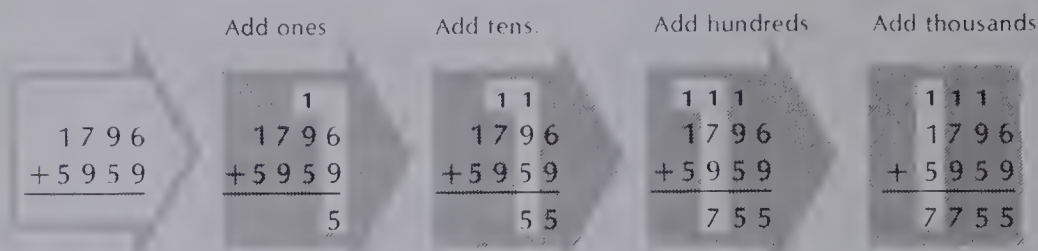
Highlight the meaning of the equal sign in an equation as you show that a change of order in the addends does not affect the sum.

Adding Greater Numbers

The Perrins of Winnipeg went on holiday to Zurich, Switzerland. First they flew 1796 km to Montreal. After switching planes, they flew 5959 km on to Zurich.

How far did they fly to get to Zurich?

$$1796 + 5959 = \blacksquare$$



They flew 7755 km to get to Zurich.

EXERCISES

Find the sum.

- 1346 + 5722 = 7068
- 7124 + 556 = 7680
- 8792 + 261 = 9053
- 6642 + 5193 = 11835
- 79174 + 6346 = 85520
- 65124 + 86487 = 151611
- 23351 + 4218 + 224 = 27793
- 572 + 68438 + 17006 = 86016

Find the sum

- 20113 + 4652 = 24765
- 58150 + 69950 = 128100
- 45000 + 25000 + 145 = 70145
- 86650 + 1937 = 88587
- 72126 + 48388 = 120514
- 97500 + 32500 + 486 = 130486

Copy and complete each equation.

- 64125 + 3468 = 67593
- 91125 + 68475 = 68475 + 91125
- 64125 + 3468 = 67593
- 43502 + 57782 = 57782 + 43502

28

Using the Exercises

- Questions 1 to 8 give practice in vertical addition of large numbers.
- Questions 9 to 14 require proper number alignment as the horizontal problems are written vertically. Students having calculation errors in the first fourteen questions should be given additional drill in the basic addition facts.
- Questions 15 to 18 require an understanding of the commutative property of addition (however, the students are not required to name the term).

UNIT 2 LESSON 3

Objective M1

Add with money.

Introducing the Lesson

Discuss places the class would like to visit or have visited on a holiday. Note the approximate costs of these trips for transportation, lodging, meals, and so on. Discuss the value of estimating all costs of a trip before travelling and then computing the actual costs afterward.

Teaching the Lesson

Point out the costs of a ski holiday given at the top of page 30. After discussing the problem, write it on the chalkboard. Discuss the importance of lining up the decimal points when adding. Explain that this helps to line up place-value positions. In money terms, if the decimal points are properly aligned, the dollars are added to dollars, dimes are added to dimes, and pennies are added to pennies.

$$\begin{array}{r} \$ 3.57 \\ 12.32 \\ + 9.35 \\ \hline \end{array}$$

Ask the students to give the approximate expenses for a trip they will or would like to take. Write the costs on the chalkboard and have the class total them as an expense budget for the trip. Write the costs to be totalled vertically and horizontally.

airfare hotel meals
 $\$695.25 + \$750.85 + \$425 = \blacksquare$

Once the costs of several trips have been estimated, give the students practice in comparing them using $<$, $>$, and $=$.

$$\$219.50 + \$344.25 < \$278.95 + \$285.50$$

$$\$75.95 + \$24.55 + \$63.45 = \$58.75 + \$105.20$$

$$\$846.35 + \$248.95 > \$86.25 + \$450.95 + \$538.10$$

Addition with Money

For a ski holiday, Jason travelled from his home in Thunder Bay, Ontario, to Mont Tremblant, Quebec. He spent \$229.00 for air fare to Montreal, \$18.35 for bus fare to the lodge, and \$375.95 for food, lodging, and lift tickets.



What was the total cost of the trip?

$$\$229.00 + \$18.35 + \$375.95 = \blacksquare$$

Keep the decimal points in a line.

$$\begin{array}{r} \$229.00 \\ 18.35 \\ + 375.95 \\ \hline \end{array}$$

Add.

$$\begin{array}{r} 1211 \\ \$229.00 \\ 18.35 \\ + 375.95 \\ \hline \$623.30 \end{array}$$

The total cost of the trip was \$623.30.

EXERCISES

Find the sum.

$$\begin{array}{r} 1. \quad \$3.54 \\ + 2.35 \\ \hline \$5.89 \end{array}$$

$$\begin{array}{r} 2. \quad \$3.72 \\ + 6.65 \\ \hline \$10.37 \end{array}$$

$$\begin{array}{r} 3. \quad \$26.38 \\ + 7.91 \\ \hline \$34.29 \end{array}$$

$$\begin{array}{r} 4. \quad \$35.64 \\ + 68.54 \\ \hline \$104.18 \end{array}$$

$$\begin{array}{r} 5. \quad \$2.48 \\ 0.16 \\ + 1.32 \\ \hline \$3.96 \end{array}$$

$$\begin{array}{r} 6. \quad \$43.72 \\ 1.84 \\ + 70.63 \\ \hline \$116.19 \end{array}$$

$$\begin{array}{r} 7. \quad \$365.34 \\ 65.12 \\ + 9.30 \\ \hline \$439.76 \end{array}$$

$$\begin{array}{r} 8. \quad \$564.32 \\ 6.91 \\ + 713.74 \\ \hline \$1284.97 \end{array}$$

Find the sum.

$$9. \quad \$16.75 + \$9.25 = \$26.00$$

$$10. \quad \$397.62 + \$3.48 = \$401.10$$

$$11. \quad \$325.40 + \$585.60 = \$911.00$$

$$12. \quad \$1465.15 + \$23.85 = \$1489.00$$

$$13. \quad \$15.80 + \$2.10 + \$6.10 = \$24.00$$

$$14. \quad \$42.50 + \$6.25 + \$2.25 = \$51.00$$

$$15. \quad \$125.30 + \$475.40 + \$3.30 = \$604.00$$

$$16. \quad \$510.85 + \$210.05 + \$8.10 = \$729.00$$

30

Using the Exercises

- All the questions involve the addition of money. The first half of the questions are written vertically and the second half horizontally. Before the students proceed with the questions at the top of page 31, check their work for proper alignment and good recall of basic facts. Remind the students that dollar signs are needed in their answers.

PRACTICE

Find the sum.

- | | | | |
|--|--|---|---|
| 1. $\begin{array}{r} \$6.85 \\ + 3.14 \\ \hline \end{array}$ | 2. $\begin{array}{r} \$4.56 \\ + 6.72 \\ \hline \end{array}$ | 3. $\begin{array}{r} \$35.95 \\ + 7.83 \\ \hline \end{array}$ | 4. $\begin{array}{r} \$26.72 \\ + 98.76 \\ \hline \end{array}$ |
| $\$9.99$ | $\$11.28$ | $\$43.78$ | $\$125.48$ |
| 5. $\begin{array}{r} \$1.25 \\ 4.36 \\ + 2.17 \\ \hline \end{array}$ | 6. $\begin{array}{r} \$63.91 \\ 0.33 \\ + 92.75 \\ \hline \end{array}$ | 7. $\begin{array}{r} \$298.20 \\ 77.45 \\ + 3.11 \\ \hline \end{array}$ | 8. $\begin{array}{r} \$913.50 \\ 47.85 \\ + 806.31 \\ \hline \end{array}$ |
| $\$7.78$ | $\$156.99$ | $\$378.76$ | 1767.66 |

Find the sum.

9. $\$45.13 + \$55.10 = \$100.23$ 10. $\$108.46 + \$2.04 = \$110.50$
 11. $\$520.67 + \$480.13 = \$1000.80$ 12. $\$1552.26 + \$13.14 = \$1565.40$
 13. $\$58.70 + \$4.05 + \$3.25 = \66.00 14. $\$26.95 + \$3.05 + \$1.18 = \31.18
 15. $\$650.40 + \$12.20 + \$12.40 = \675.00 16. $\$755.35 + \$10.15 + \$10.50 = \776.00

Copy and complete. Use $<$, $=$, or $>$

17. $\$23.56 + \$78.25 \bullet \$61.48 + \40.33
 18. $\$44.97 + \$658.66 \bullet \$314.96 + \384.86
 $>$

Solve.

19. A tourist travelled from Victoria to Vancouver on a bus, a ferry, and a taxi. The bus fare was \$2.50; the ferry cost \$3.75; the taxi ride was \$15.35. What was the total cost? $\$21.60$

USING THE CALCULATOR

Which problems are incorrect? Use a calculator to find the correct sums.

- | | | |
|--|---|---|
| a. $\begin{array}{r} \$5\ 473.98 \\ 6\ 952.36 \\ 4\ 279.83 \\ + 9\ 726.38 \\ \hline \end{array}$ | b. $\begin{array}{r} \$\ 659.39 \\ 5764.50 \\ 426.78 \\ + 657.95 \\ \hline \end{array}$ | c. $\begin{array}{r} \$\ 7.36 \\ 246.87 \\ 5987.95 \\ + 476.32 \\ \hline \end{array}$ |
| $\$27\ 533.55$ | $\$7508.62$ | $\$6950.17$ |
| $\$26\ 432.55$ | $\$7508.62$ | $\$6718.50$ |

31

Assigning the Practice

Minimum: even numbers

Average: 1-12, 17-19

Enriched: 5-19

Reinforcement

1. Recall the use of the calculator for adding. Have the students practise with several examples.

Assign *Using the Calculator* at the bottom of page 31.

2. Ask the students to use a calculator to add problems a and d, note the pattern and then guess the sums for problems e and f.

- | | |
|---|---|
| a. $\begin{array}{r} 123 \\ +321 \\ \hline \end{array}$ | b. $\begin{array}{r} 1234 \\ +4321 \\ \hline \end{array}$ |
| c. $\begin{array}{r} 12\ 345 \\ 54\ 321 \\ \hline \end{array}$ | d. $\begin{array}{r} 123\ 456 \\ 654\ 321 \\ \hline \end{array}$ |
| e. $\begin{array}{r} 1\ 234\ 567 \\ +7\ 654\ 321 \\ \hline \end{array}$ | f. $\begin{array}{r} 12\ 345\ 678 \\ +87\ 654\ 321 \\ \hline \end{array}$ |

Enrichment

1. Pose these questions, either on activity cards or on a worksheet.

- How can you make \$48.13 with 8 bills and 4 coins?
- How can you make \$25.95 with 14 bills and 5 coins?
- How can you make \$57.89 with 3 bills and 10 coins?
- How can you make \$41.10 with 6 bills and 6 coins?
- How can you make \$92.99 with 6 bills and 6 coins?

2. Have the students use a calculator to add the following. Tell them to look for a pattern and then to predict more sums.

- $5678 + 9999 = ?$
- $5678 + 9999 + 9999 = ?$
- $5678 + 9999 + 9999 + 9999 = ?$

Extra Practice

Find the sum.

- | | | | |
|---|---|---|---|
| 1. $\begin{array}{r} \$74.28 \\ + 9.85 \\ \hline \end{array}$ | 2. $\begin{array}{r} \$352.86 \\ + 4.55 \\ \hline \end{array}$ | 3. $\begin{array}{r} \$\ 86.98 \\ + 751.32 \\ \hline \end{array}$ | 4. $\begin{array}{r} \$\ 2.48 \\ + 139.56 \\ \hline \end{array}$ |
| $\$84.13$ | $\$357.41$ | $\$838.30$ | $\$142.04$ |
| 5. $\begin{array}{r} \$\ 16.45 \\ 275.86 \\ + 3.50 \\ \hline \end{array}$ | 6. $\begin{array}{r} \$276.87 \\ 9.49 \\ + 36.27 \\ \hline \end{array}$ | 7. $\begin{array}{r} \$956.21 \\ 47.89 \\ + 6.55 \\ \hline \end{array}$ | 8. $\begin{array}{r} \$867.42 \\ 35.29 \\ + 417.26 \\ \hline \end{array}$ |
| $\$295.81$ | $\$322.63$ | $\$1010.65$ | $\$1319.97$ |
| 9. $\$426.85 + \$37.86 + \$2.38 = \467.09 | 10. $\$25.63 + \$39.77 + \$524.95 = \590.35 | | |

Round to the nearest ten dollars. Write the estimated sum.

1. $\$42.35 + \$79.25 + \$91.99 = \210 12. $\$12.95 + \$49.99 + \$17.10 = \80
 $\$40 + \$80 + \$90 = \210 $\$10 + \$50 + \$20 = \80
 13. Mrs. Axley's air ticket cost \$159.95. Her taxi ride cost \$16.50 and the hotel charge was \$84.50. What was the total cost of the transportation on her trip? $\$260.95$

Worksheet M1

Pages 30-31

Objective A3

Add tenths, hundredths, and thousandths.

Introducing the Lesson

Ask the students about trips they have taken by car. How many days were spent driving? About how many times was the tank filled up with gas? How is the amount of gas for a fill-up written? (In tenths, e.g., 56.5 L.) How is the cost per litre posted? (In tenths of a cent.)

Teaching the Lesson

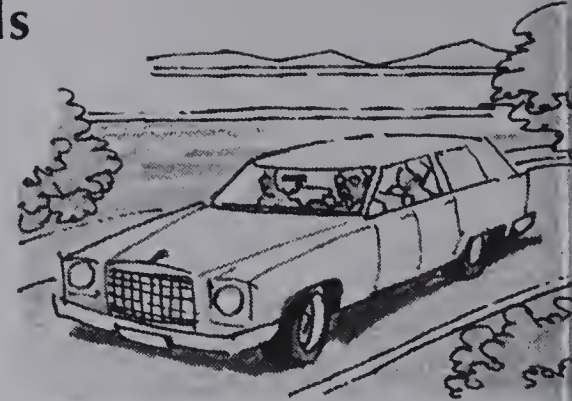
Read and discuss the situation given at the top of page 32. Point out that only one of the three additions shows reasonable amounts of gasoline. Discuss the reasons why the other two additions include unreasonable amounts of gasoline for a car fill-up. Explain that all three additions are correct, even though two are not reasonable for this situation.

Ask the class to close their books. Write the three additions at the top of page 32 *horizontally* on the chalkboard. Direct the students to find the sums. Remind them to line up the decimal points so tenths will be added to tenths, hundredths to hundredths, etc. When they are finished, ask the class to open their books and check their work. Constructively discuss the causes of any errors they make.

Continue practising the addition of tenths, hundredths, and thousandths by asking individual students to write problems on the chalkboard for the rest of the class to solve.

Addition of Decimals

On a recent driving tour of Vancouver Island, the Wallers filled their gas tank three times. At each fill-up, the tank was nearly empty. Which addition below could correctly show the total amount of gas they used?



Keep the decimal points in a line.
Add like whole numbers.

$$\begin{array}{r} 111 \\ 483 \\ 53.9 \\ + 5.17 \\ \hline 542.07 \end{array}$$

$$\begin{array}{r} 11 \\ 48.3 \\ 53.9 \\ + 51.7 \\ \hline 153.9 \end{array}$$

$$\begin{array}{r} 11.1 \\ 48.3 \\ 5.39 \\ + 0.517 \\ \hline 54.207 \end{array}$$

Which sum makes sense for 3 gas fill-ups?

EXERCISES

Find the sum.

- | | | | | |
|---|--|--|--|---|
| 1. $\begin{array}{r} 6.7 \\ + 2.0 \\ \hline 8.7 \end{array}$ | 2. $\begin{array}{r} 6.7 \\ + 2 \\ \hline 8.7 \end{array}$ | 3. $\begin{array}{r} 54.00 \\ + 9.78 \\ \hline 63.78 \end{array}$ | 4. $\begin{array}{r} 54.0 \\ + 9.78 \\ \hline 63.78 \end{array}$ | 5. $\begin{array}{r} 6.197 \\ + 4.200 \\ \hline 10.397 \end{array}$ |
| 6. $\begin{array}{r} 6.197 \\ + 4.2 \\ \hline 10.397 \end{array}$ | 7. $\begin{array}{r} 8.20 \\ 7.03 \\ + 5.00 \\ \hline 20.23 \end{array}$ | 8. $\begin{array}{r} 8.2 \\ 7.03 \\ + 5.0 \\ \hline 20.23 \end{array}$ | 9. $\begin{array}{r} 12.987 \\ 6.000 \\ + 9.95 \\ \hline 28.937 \end{array}$ | 10. $\begin{array}{r} 12.987 \\ 6.0 \\ + 9.95 \\ \hline 28.937 \end{array}$ |
| 11. $\begin{array}{r} 5.9 \\ + 8.0 \\ \hline 13.9 \end{array}$ | 12. $\begin{array}{r} 7.03 \\ + 9.4 \\ \hline 16.43 \end{array}$ | 13. $\begin{array}{r} 6.9 \\ + 8.465 \\ \hline 15.365 \end{array}$ | 14. $\begin{array}{r} 0.567 \\ 0.9 \\ + 0.68 \\ \hline 2.147 \end{array}$ | 15. $\begin{array}{r} 2.6 \\ 38.347 \\ + 8.75 \\ \hline 49.697 \end{array}$ |

Find the sum.

- | | |
|-------------------------|------------------------------------|
| 16. $3.2 + 0.59 = 3.79$ | 17. $7.26 + 13.9 + 4.177 = 25.337$ |
| 18. $28 + 0.95 = 28.95$ | 19. $4.2 + 95 + 8.85 = 108.05$ |

Using the Exercises

- It is most important to check the students' work for questions 1 to 19 for proper alignment of decimal points and digits. If any students have problems with this, have them do their work on graph paper.

PRACTICE

Find the sum.

- | | | | | |
|---|--|---|--|--|
| 1. 62.5
$+ 5.9$
<u>68.4</u> | 2. 15.73
$+ 9.62$
<u>25.35</u> | 3. 20.165
$+ 4.913$
<u>25.078</u> | 4. 8.76
$+ 40.91$
<u>49.67</u> | 5. 3.552
$+ 27.989$
<u>31.541</u> |
| 6. 5.74
$+ 6.8$
<u>12.54</u> | 7. 9.6
$+ 4.89$
<u>14.49</u> | 8. 32.6
$+ 5.86$
<u>38.46</u> | 9. 4.295
$+ 3.18$
<u>7.475</u> | 10. 5.63
$+ 8.473$
<u>14.103</u> |
| 11. 32.6
$+ 576.09$
<u>608.69</u> | 12. 5.778
$+ 42.5$
<u>48.278</u> | 13. 6.137
5.72
$+ 1.8$
<u>13.657</u> | 14. 52.6
7.953
$+ 8.43$
<u>68.983</u> | 15. 35.0
7.689
$+ 428.7$
<u>471.389</u> |

Find the sum.

16. $6.3 + 45.59$ 51.89
17. $5.147 + 8.2 + 63.49$ 76.837
18. $26 + 0.421$ 26.421
19. $0.2 + 195 + 6.88$ 202.08

Copy and complete each equation.

20. $8.2 + 4.6 = 8 + \blacksquare$ 4.8
21. $5.7 + 3.1 = 5 + \blacksquare$ 3.8
22. $11.4 + 9.5 = 11 + \blacksquare$ 9.9
23. $4.12 + 6.52 = 4 + \blacksquare$ 6.64

Palindromes

A **palindrome** is a number that reads the same forwards and backwards. 12 321 is a palindrome. You can make a number into a palindrome by reversing its digits and adding.

Make 763 into a palindrome.

- 763
 $+ 367$ Reverse digits and add.
1130
 $+ 0311$ Reverse digits and add.
1441 A palindrome

- a. 666
b. 929
c. 9119
d. 26 862

Make palindromes!

- a. 234
b. 514
c. 637
d. 168

33

Assigning the Practice

Minimum: 1-17

Average: 1-19

Enriched: 5-23

Reinforcement

Provide the following worksheet to sharpen estimating skills. An estimated sum is the required response. Each circled number matches two problems.

- $4.95 + 8.2 + 3.07$
- $7.239 + 8.5 + 1.43$
- $7.895 + 2.2 + 5.324$
- $5.6 + 3.409 + 4.21$
- $12 + 0.499 + 5.7$
- $11 + 0.777 + 2.8$
- $4.42 + 0.853 + 9.3333$
- $2.976 + 6 + 7.679$

(14)

(15)

(16)

(17)

Enrichment

1. Read and discuss the meaning of a **palindrome** as shown at the bottom of page 33. Let the students follow the procedure given to make palindromes of the four examples.

2. Have the students try these palindrome activities.

- a. Assign a number to each letter of the alphabet. (a-1, b-2, c-3, etc.) Each student writes his or her name, adds the numbers matching the letters, and makes a palindrome with the sum.

$$\begin{array}{r} \text{Ann} = 1 + 14 + 14 = 29 \\ \quad \quad \quad 92 \\ \hline \quad \quad \quad 121 \text{ a palindrome} \end{array}$$

- b. Write the last two digits of the year you were born. Make a palindrome from the number by reversing and adding.

Extra Practice

Worksheet A3

Pages 32-33

Find the sum.

1. $9.2 + 35 + 16.78 =$ 60.98
2. $1.457 + 3.9 + 65.73 =$ 71.087
3. $347.8 + 0.864 + 48 =$ 396.664
4. $5.63 + 2.178 + 784.36 =$ 792.168
5. $36.5 + 8.489 + 637 =$ 681.989
6. $26.98 + 175 + 3.486 =$ 205.466
7. $3.7 + 48.75 + 0.089 =$ 52.539
8. $495 + 6.72 + 18.437 =$ 520.157

Round to the nearest whole number. Write the estimated sum.

9. $5.6 + 24.13 + 2.1 =$ 32.0
10. $65.12 + 7.9 + 8.2 =$ 81.0
11. $3.7 + 31.08 + 5.9 =$ 41.0
12. $4.5 + 8.5 + 32.99 =$ 47.0

Objective A4

Add more than two addends.

Introducing the Lesson

To prepare the students for the addition required in this lesson, provide an oral addition drill of single digit numbers. Begin by saying only three numbers to be added mentally: "8, 9, 6," or "7, 4, 8." Then say four addends: "7, 5, 8, 6," or "9, 4, 8, 3." After some practice, let one of the students take your place in saying the numbers.

Teaching the Lesson

Read and discuss the bicycle tour problem at the top of page 34. Work through the solution at the chalkboard, stressing again proper number alignment. Ask the students to add the ones and tens columns. Determine the methods used. Did anyone *look for 10s* and combine them first? Explain how *looking for 10s* makes column addition easier.

1. Add ones.

2. Add tens.

$$\begin{array}{r} 2 \\ 43 \\ 35 \\ 39 \\ 45 \\ +37 \\ \hline 199 \end{array}$$

3 + 4 + 3 = 10

10 + 3 + 4 + 2 = 19

3 + 7 = 10

5 + 5 = 10

10 + 10 + 9 = 29

Provide more practice in additions with four or five addends. Let the students work them at the chalkboard. Encourage the students to *look for 10s* as they add.

Looking for 10s should also be explained this way: 9 + 7 + 3 is more easily added by grouping the ten. Add 9 + (7 + 3) rather than (9 + 7) + 3. Note that either grouping of the addends still gives an answer of 19.

Point out also examples of *looking for 100s*. 78 + 19 + 81 is computed more easily by grouping the hundred 78 + (19 + 81) than by adding (78 + 19) + 81.

(The concept of the associative property can be understood at this time without the students naming it.)

More Addends

On a leisurely bicycle tour of the Nova Scotia coast, Claude rode 43 km on the first day, 35 km on the second day, 39 km on the third day, 45 km on the fourth day, and 37 km on the fifth day. How far in all did he travel on his bicycle?

Add ones.

$$\begin{array}{r} 2 \\ 43 \\ 35 \\ 39 \\ 45 \\ +37 \\ \hline 9 \end{array}$$

Add tens.

$$\begin{array}{r} 2 \\ 43 \\ 35 \\ 39 \\ 45 \\ +37 \\ \hline 199 \end{array}$$

43 + 35 + 39 + 45 + 37 = ■ He travelled 199 km in all.

EXERCISES

Find the sum.

1. $\begin{array}{r} 24 \\ 83 \\ +62 \\ \hline 169 \end{array}$

2. $\begin{array}{r} 72 \\ 98 \\ 45 \\ +35 \\ \hline 250 \end{array}$

3. $\begin{array}{r} 413 \\ 624 \\ 352 \\ +712 \\ \hline 2101 \end{array}$

4. $\begin{array}{r} 46 \\ 5 \\ 3 \\ 24 \\ +62 \\ \hline 140 \end{array}$

5. $\begin{array}{r} 248 \\ 22 \\ 63 \\ 8 \\ +135 \\ \hline 476 \end{array}$

6. $\begin{array}{r} 4.3 \\ 2.1 \\ 6.5 \\ +8.2 \\ \hline 21.1 \end{array}$

7. $\begin{array}{r} 7.8 \\ 6.0 \\ 5.2 \\ +8.0 \\ \hline 27.0 \end{array}$

8. $\begin{array}{r} 5.32 \\ 2.43 \\ 1.78 \\ +4.21 \\ \hline 13.74 \end{array}$

9. $\begin{array}{r} 6.12 \\ 5.0 \\ 3.7 \\ 8.3 \\ +9.18 \\ \hline 32.30 \end{array}$

10. $\begin{array}{r} 4.62 \\ 7.2 \\ 31.0 \\ 5.4 \\ +8.11 \\ \hline 56.33 \end{array}$

Find the sum.

11. 27 + 43 + 9 **79**

12. 75 + 8 + 6 + 32 **121**

13. 5.3 + 2.4 + 6.1 + 7.2 **21.0**

14. 8.7 + 6 + 3.5 + 5 **23.2**

Copy and complete.

15. (13 + 8) + 2 = 13 + (8 + **2**)

16. (16 + 11) + 9 = 16 + (**11** + 9)

Using the Exercises

- Questions 1 to 14 involve additions with up to five addends. In all questions, proper number alignment is essential, especially in those printed horizontally in the text (questions 11 to 14). Students should also be aware that questions 6 to 10 and 13 to 14 include decimal points. There are many opportunities in these questions to look for 10s.
- Questions 15 and 16 involve the application of the associative property by grouping 10s.

Practice

Find the sum.

$$\begin{array}{r} 1. \quad 97 \\ 34 \\ 65 \\ +73 \\ \hline 269 \end{array} \quad \begin{array}{r} 2. \quad 6.5 \\ 3.9 \\ 4.2 \\ +7.7 \\ \hline 22.3 \end{array} \quad \begin{array}{r} 3. \quad 5.6 \\ 8.0 \\ 3.4 \\ +5.0 \\ \hline 22.0 \end{array} \quad \begin{array}{r} 4. \quad 157 \\ 28 \\ 35 \\ 9 \\ +248 \\ \hline 477 \end{array} \quad \begin{array}{r} 5. \quad 19 \\ 2.5 \\ 13 \\ 14.2 \\ +6.1 \\ \hline 54.8 \end{array}$$

Find the sum.

$$6. \quad 163 + 4 + 29 + 75 = 271 \quad 7. \quad 3.5 + 6 + 12.2 + 4.8 + 9.5 = 36$$

Copy and complete each equation.

$$\begin{array}{l} 8. \quad (6 + 8) + 2 = 6 + (\square + 2) \quad 8 \\ 9. \quad (13 + 91) + 9 = 13 + (91 + \square) \quad 9 \\ 10. \quad 55 + (45 + 79) = (55 + \square) + 79 \quad 45 \\ 11. \quad 15 + (85 + 78) = (\square + 85) + 78 \quad 15 \end{array}$$

Place parentheses around the easier addition first. Find the sum.

$$\begin{array}{l} 12. \quad 75 + 25 + 89 = 189 \quad 13. \quad 39 + 84 + 16 = 139 \\ 14. \quad 49 + 51 + 75 = 175 \quad 15. \quad 76 + 65 + 35 = 176 \end{array}$$

Review

Write vertically. Find the sum.

$$\begin{array}{l} A1 \quad 1. \quad 342 + 75 = 417 \quad 2. \quad 958 + 713 = 1671 \quad 3. \quad 495 + 116 = 611 \\ A2 \quad 4. \quad 61\,305 + 9742 = 71\,047 \quad 5. \quad 1124 + 3576 + 27\,592 = 32\,292 \\ M1 \quad 6. \quad \$45.25 + \$16.89 = \$62.14 \quad 7. \quad \$6.39 + \$4.15 + \$12.95 = \$23.49 \\ A3 \quad 8. \quad 4.3 + 6.93 = 11.23 \quad 9. \quad 5.2 + 6.75 + 4.837 = 16.787 \\ A4 \quad 10. \quad 9 + 48 + 216 + 4275 = 4548 \quad 11. \quad 8.5 + 0.9 + 62.37 + 0.174 = 71.944 \end{array}$$

35

Assigning the Practice

Minimum: 1-10

Average: 1-12

Enriched: 4-15

Review Exercises

Questions	Objective	Pages
1-3	A1	26-27
4-5	A2	28-29
6-7	M1	30-31
8-9	A3	32-33
10-11	A4	34-35

Reinforcement

Have the students study the display of numbers and then find the sums suggested by the patterns below.

13.4	72	4.26
123.2	0.45	8.08
5.03	56	329

$$\begin{array}{l} a. \quad \square + \square \\ b. \quad \square + \square \\ c. \quad \square + \square + \square \\ d. \quad \square + \square + \square \\ e. \quad \square + \square + \square + \square \\ f. \quad \square + \square + \square \\ g. \quad \square + \square + \square \\ h. \quad \square + \square + \square + \square + \square \\ j. \quad \square + \square + \square + \square + \square + \square + \square + \square \end{array}$$

Enrichment

1. Display these number arrangement problems.

- Arrange fifteen 2s as an addition problem with a sum of 100.
- Arrange seven 4s as an addition problem with a sum of 100.

2. Ask the students to discover the digit (from 0 to 9) that each letter stands for. Direct them to write the addition with the correct numbers.

$$\begin{array}{r} a. \quad \text{TWO} \\ + \text{TWO} \\ \hline \text{FOUR} \end{array} \quad \begin{array}{r} b. \quad \text{SEND} \\ + \text{MORE} \\ \hline \text{MONEY} \end{array}$$

Hint: F = 1

Solution:

$$\begin{array}{r} 765 \\ +765 \\ \hline 1530 \end{array} \quad \text{or} \quad \begin{array}{r} 867 \\ +867 \\ \hline 1734 \end{array} \quad \begin{array}{r} 9\,567 \\ +1\,085 \\ \hline 10\,652 \end{array}$$

Extra Practice

Worksheet A4

Pages 34-35

Find the sum.

$$\begin{array}{l} 257 + 6 + 95 + 8 + 135 = 501 \quad 2. \quad 4 + 88 + 375 + 7 + 29 = 503 \\ 6 + 29 + 468 + 94 + 367 = 964 \quad 4. \quad 5126 + 2 + 37 + 574 + 6 = 5745 \\ 3 + 4.2 + 0.65 + 41 + 8 = 56.85 \quad 6. \quad 12 + 3.76 + 1.2 + 386 + 7 = 409.96 \\ 46 + 925 + 8.72 + 7 + 0.4 = 987.12 \quad 8. \quad 0.125 + 28 + 3.4 + 4.69 + 8 = 44.215 \end{array}$$

Round to the nearest ten. Write the estimated sum.

$$\begin{array}{l} 27 + 18 + 11 + 42 = 100 \quad 10. \quad 38 + 19 + 12.5 + 27.9 = 100 \\ 30 + 20 + 10 + 40 = 100 \quad 12. \quad 73 + 47 + 69 + 32.5 = 220 \\ 82 + 68 + 96 + 55 = 310 \quad 70 + 50 + 70 + 30 = 220 \\ 80 + 70 + 100 + 60 = 310 \end{array}$$

ve.

Mr. Ennis' suitcases have masses of 16.3 kg, 7.9 kg, and 5.2 kg. What is their total mass? 29.4 kg

Objective A5

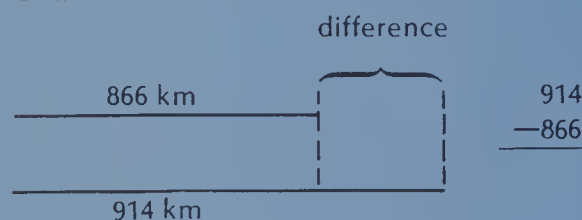
Subtract two- and three-digit numbers.

Introducing the Lesson

With a large wall map of eastern Canada point out the cities, Rouyn, Que., Quebec City, Que., and Yarmouth, N.S. Has anyone in the class visited these cities? What are the cities like? Discuss the likenesses and differences of the land, climate, and life in the three cities.

Teaching the Lesson

Refer the class to the problem situation presented at the top of page 36. Recall the meaning of the term *difference*. Sketch the distances on the chalkboard.



Write the subtraction that solves the problem on the chalkboard and review the regrouping procedure required. Stress the importance of *checking* subtractions by adding. For further practice, the student can use a Canadian wall map to *estimate* and then compute the difference in driving distances between the cities. The following driving distances can also be used.

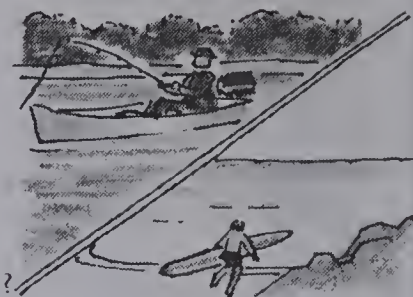
- a. Saskatoon, Sask., to Banff, Alta. — 748 km
Saskatoon, Sask., to Winnipeg, Man. — 829 km
Have students draw lines to indicate the difference.
- b. Chicoutimi, Que., to Fredericton, N.B. — 562 km
Chicoutimi, Que., to Montreal, Que. — 476 km

Particular attention should be given to subtraction with zeros in the minuend.

- c. Yarmouth, N.S., to Sydney, N.S. — 702 km
Yarmouth, N.S., to Charlottetown, P.E.I. — 497 km

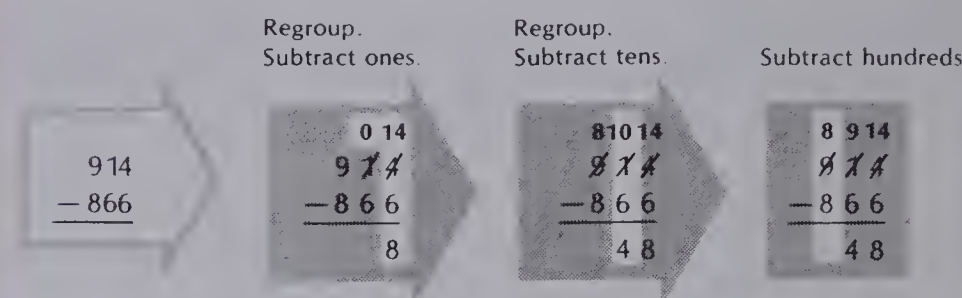
Two- and Three-Place Subtraction

Noelle enjoyed being at a lake on her holidays in Rouyn, Quebec. She travelled 914 km by car from Quebec City to get there. Marie stayed near the ocean on her holiday in Yarmouth, Nova Scotia. She travelled 866 km by car from Quebec City to get there.



How much farther did Noelle go on her holidays?

$$914 - 866 = \blacksquare$$



Noelle went 48 km farther. Check: $48 + 866 = 914$.

EXERCISES

Find the difference.

- | | | | | |
|---|--|---|--|---|
| 1. $\begin{array}{r} 67 \\ - 28 \\ \hline 39 \end{array}$ | 2. $\begin{array}{r} 467 \\ - 128 \\ \hline 339 \end{array}$ | 3. $\begin{array}{r} 51 \\ - 37 \\ \hline 14 \end{array}$ | 4. $\begin{array}{r} 651 \\ - 37 \\ \hline 614 \end{array}$ | 5. $\begin{array}{r} 951 \\ - 537 \\ \hline 414 \end{array}$ |
| 6. $\begin{array}{r} 40 \\ - 23 \\ \hline 17 \end{array}$ | 7. $\begin{array}{r} 740 \\ - 423 \\ \hline 317 \end{array}$ | 8. $\begin{array}{r} 80 \\ - 57 \\ \hline 23 \end{array}$ | 9. $\begin{array}{r} 800 \\ - 657 \\ \hline 143 \end{array}$ | 10. $\begin{array}{r} 800 \\ - 257 \\ \hline 543 \end{array}$ |
| 11. $546 - 95$
$\underline{451}$ | 12. $257 - 88$
$\underline{169}$ | 13. $654 - 428$
$\underline{226}$ | 14. $502 - 245$
$\underline{257}$ | |
- Subtract. Check by adding.
- | | | | |
|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 15. $514 - 65$
$\underline{449}$ | 16. $321 - 186$
$\underline{135}$ | 17. $902 - 788$
$\underline{114}$ | 18. $300 - 187$
$\underline{113}$ |
|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|

Using the Exercises

- Questions 1 to 18 involve finding the differences. Note that questions 6 to 10, 14, 17, and 18 involve subtraction with a zero in the minuend. Questions 11 to 18 must be written vertically. Any student experiencing difficulty with these questions should be given additional help according to the cause of his or her problem (basic subtraction facts or regrouping procedures).

PRACTICE

Find the difference.

- | | | | | |
|--|--|--|--|---|
| 1. $\begin{array}{r} 429 \\ - 87 \\ \hline 342 \end{array}$ | 2. $\begin{array}{r} 574 \\ - 38 \\ \hline 536 \end{array}$ | 3. $\begin{array}{r} 475 \\ - 29 \\ \hline 446 \end{array}$ | 4. $\begin{array}{r} 531 \\ - 170 \\ \hline 361 \end{array}$ | 5. $\begin{array}{r} 352 \\ - 109 \\ \hline 243 \end{array}$ |
| 6. $\begin{array}{r} 641 \\ - 374 \\ \hline 267 \end{array}$ | 7. $\begin{array}{r} 831 \\ - 448 \\ \hline 383 \end{array}$ | 8. $\begin{array}{r} 905 \\ - 166 \\ \hline 739 \end{array}$ | 9. $\begin{array}{r} 600 \\ - 395 \\ \hline 205 \end{array}$ | 10. $\begin{array}{r} 700 \\ - 249 \\ \hline 451 \end{array}$ |
| 11. $321 - 68 = 253$ | 12. $409 - 82 = 327$ | 13. $654 - 188 = 466$ | 14. $227 - 166 = 61$ | |

Subtract. Check by adding.

- | | | | |
|--|---|---|---|
| 15. $\begin{array}{r} 573 \\ - 96 \\ \hline 477 \end{array}$ | 16. $\begin{array}{r} 400 \\ - 233 \\ \hline 167 \end{array}$ | 17. $\begin{array}{r} 907 \\ - 568 \\ \hline 339 \end{array}$ | 18. $\begin{array}{r} 401 \\ - 209 \\ \hline 192 \end{array}$ |
|--|---|---|---|

Solve.

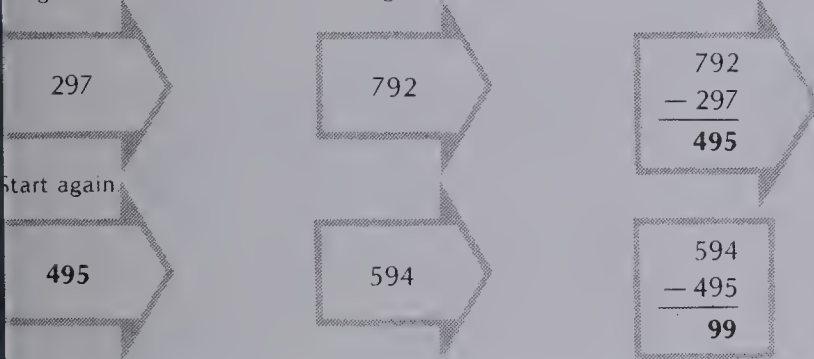
19. A restaurant can seat 84 people. If 48 of these seats are for non-smokers, how many are for smokers? **36**
20. One evening the restaurant served 141 chicken dinners. It served 98 fewer beef dinners on the same evening. How many beef dinners were served? **43**

Subtraction Surprises

Choose any 3-digit numeral.

Reverse the digits.

Subtract



Try other numbers. What happens?

37

Extra Practice

Worksheet A5

Pages 36-37

Find the difference. Check by adding.

- | | | | |
|---|--|---|---|
| 1. $\begin{array}{r} 321 \\ - 89 \\ \hline 232 \end{array}$ | 2. $\begin{array}{r} 564 \\ - 319 \\ \hline 245 \end{array}$ | 3. $\begin{array}{r} 801 \\ - 23 \\ \hline 778 \end{array}$ | 4. $\begin{array}{r} 400 \\ - 327 \\ \hline 73 \end{array}$ |
| $653 - 78 = 575$ | $405 - 278 = 127$ | $300 - 124 = 176$ | |
| between 95 and 546 | 9. between 257 and 99 | 10. between 745 and 902 | |
| 451 | 158 | 157 | |

Round to the nearest hundred. Write the estimated difference.

- $395 - 219 = 200$ 12. $627 - 113 = 500$ 13. $878 - 243 = 700$

Solve.

Ms. Walker drove 369 km from Toronto to Windsor one day. Another day she drove 399 km to Ottawa. How much farther is Ottawa from Toronto? **30 km**

Assigning the Practice

Minimum: 1-16

Average: 6-19

Enriched: 11-20

Reinforcement

1. All students should enjoy discovering what happens each time to three-digit numbers in *Subtraction Surprises* at the bottom of page 37.

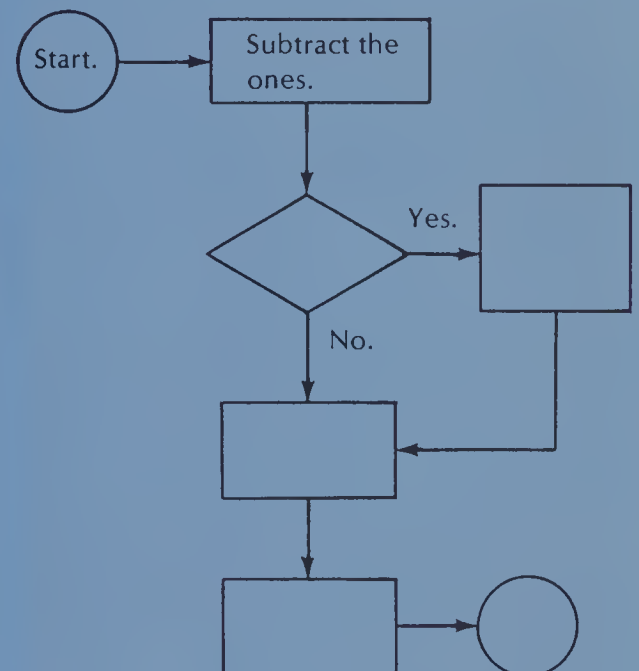
2. Have pairs of students make four sets of number cards from 0 to 9 and play the following game.

Each player is dealt six cards. He or she then uses the cards to form two three-digit numbers and subtracts the smaller number from the larger. The player who has the largest difference scores a point. The first player to score 15 points wins.

Enrichment

1. Have the students recall the structure of a flow chart as presented in Unit 1. Then ask them to finish the following flow chart.

How to subtract 439 from 891



2. Encourage the students to devise flow charts for simple tasks. Display the results.

UNIT 2 LESSON 7

Objective A6

Subtract four- and five-digit numbers.

Introducing the Lesson

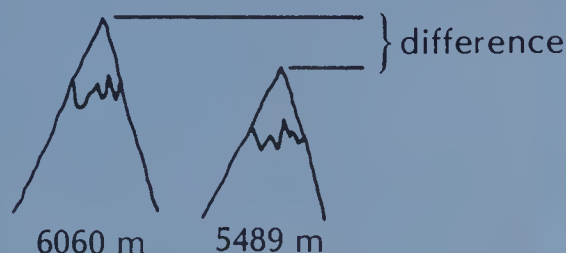
Use a topographical map of North America to point out the highest mountain peaks.

Mt. McKinley (U.S.A.)	6194 m
Mt. Logan (Can.)	6060 m
Mt. St. Elias (Can.)	5489 m
Mt. Lucania (Can.)	5226 m
King Peak (Can.)	5173 m
Mt. Whitney (U.S.A.)	4418 m

Have any students seen these mountains? Can anyone describe what it is like to climb a mountain?

Teaching the Lesson

Point out the problem situation given at the top of page 38. Sketch a picture of the two mountains on the chalkboard and show the difference.



Recall the subtraction procedure reviewed in the previous lesson as you work and discuss the problem at the chalkboard. Additional practice with four-digit and five-digit subtraction can be given by comparing mountain peaks and trenches.

- Difference in height of Mt. Logan and Mt. Lucania
- Difference in depth of the Mariana Trench (Pacific O.), 11 022 m, and the Aleutian Trench (Pacific O.), 7822 m.
- Difference in depth of the Mariana Trench (Pacific O.), 11 022 m, and the Japan Trench (Pacific O.), 10 554 m.

More practice with these kinds of subtractions should be given as needed. Encourage the use of estimating the difference *before* subtracting and of checking the difference by adding *after* subtracting.

Subtracting Greater Numbers

Ian visited Mt. St. Elias in the Yukon on his holidays. He found out that it is 5489 m high. Mt. Logan, which is Canada's highest mountain, is 6060 m high.

How much higher is Mt. Logan?

$$6060 - 5489 = \blacksquare$$

Regroup
Subtract ones

$$\begin{array}{r} 5 \ 10 \\ 60\cancel{6}\cancel{0} \\ - 5489 \\ \hline 1 \end{array}$$

Regroup
Subtract tens

$$\begin{array}{r} 5 \ 91510 \\ \cancel{6}\cancel{0}\cancel{6}\cancel{0} \\ - 5489 \\ \hline 71 \end{array}$$

Subtract
hundreds

$$\begin{array}{r} 5 \ 91510 \\ \cancel{6}\cancel{0}\cancel{6}\cancel{0} \\ - 5489 \\ \hline 571 \end{array}$$

Subtract
thousands

$$\begin{array}{r} 5 \ 91510 \\ \cancel{6}\cancel{0}\cancel{6}\cancel{0} \\ - 5489 \\ \hline 571 \end{array}$$

Mt. Logan is 571 m higher. Check: $571 + 5489 = 6060$

EXERCISES

Find the difference.

- $\begin{array}{r} 7152 \\ - 3024 \\ \hline 4128 \end{array}$
- $\begin{array}{r} 5843 \\ - 1271 \\ \hline 4572 \end{array}$
- $\begin{array}{r} 4037 \\ - 3216 \\ \hline 821 \end{array}$
- $\begin{array}{r} 56176 \\ - 2843 \\ \hline 53333 \end{array}$
- $\begin{array}{r} 3117 \\ - 1425 \\ \hline 1692 \end{array}$
- $\begin{array}{r} 5831 \\ - 2658 \\ \hline 3173 \end{array}$
- $\begin{array}{r} 27314 \\ - 5186 \\ \hline 22128 \end{array}$
- $\begin{array}{r} 56253 \\ - 45782 \\ \hline 10471 \end{array}$

Subtract. Check by adding.

- $\begin{array}{r} 3674 \\ - 968 \\ \hline 2706 \end{array}$
- $\begin{array}{r} 72956 \\ - 8388 \\ \hline 64568 \end{array}$
- $\begin{array}{r} 57102 \\ - 8435 \\ \hline 48667 \end{array}$
- $\begin{array}{r} 90040 \\ - 57617 \\ \hline 32423 \end{array}$

Round to the nearest thousand or ten thousand.

Write an estimated difference.

- $\begin{array}{r} 6180 \\ - 3987 \\ \hline 2000 \end{array}$
- $\begin{array}{r} 2117 \\ - 1969 \\ \hline 0 \end{array}$
- $\begin{array}{r} 50004 \\ - 32765 \\ \hline 20000 \end{array}$
- $\begin{array}{r} 80101 \\ - 51212 \\ \hline 30000 \end{array}$

Using the Exercises

- Questions 1 to 12 require the subtraction of four- and five-digit numbers. Questions 3, 11, and 12 have zeros in the minuend. Although only questions 9 to 12 require checking, some students who lack confidence in their subtraction ability may need to check all twelve problems.
- Questions 13 to 16 give practice in rounding and in estimating differences.

PRACTICE

Find the difference.

1. $\begin{array}{r} 3172 \\ - 1845 \\ \hline 1327 \end{array}$
2. $\begin{array}{r} 6907 \\ - 4899 \\ \hline 2008 \end{array}$
3. $\begin{array}{r} 5315 \\ - 2828 \\ \hline 2487 \end{array}$
4. $\begin{array}{r} 60124 \\ - 8033 \\ \hline 52091 \end{array}$
5. $\begin{array}{r} 9000 \\ - 3154 \\ \hline 5846 \end{array}$
6. $\begin{array}{r} 54003 \\ - 22014 \\ \hline 31989 \end{array}$
7. $\begin{array}{r} 74044 \\ - 23675 \\ \hline 50369 \end{array}$
8. $\begin{array}{r} 57876 \\ - 23478 \\ \hline 34398 \end{array}$

Subtract. Check by adding.

9. $\begin{array}{r} 4040 \\ - 2342 \\ \hline 1698 \end{array}$
10. $\begin{array}{r} 4004 \\ - 2342 \\ \hline 1662 \end{array}$
11. $\begin{array}{r} 40400 \\ - 2342 \\ \hline 38058 \end{array}$
12. $\begin{array}{r} 40004 \\ - 2342 \\ \hline 37662 \end{array}$

Round to the nearest thousand.

Write an estimated difference.

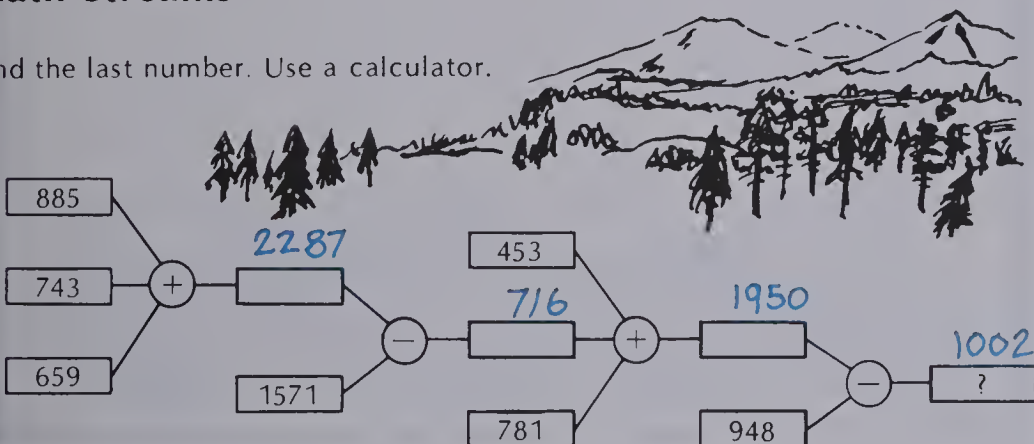
13. $5213 - 957$ 4000
14. $40126 - 3995$ 36000
15. $79206 - 5002$ 74000

Solve.

16. Mt. Everest, the highest mountain in the world, is 8848 m high. How much higher is it than Mt. St. Elias? 3359 m
17. Mt. McKinley, the highest mountain in North America, is 6194 m. What is the difference in height between Mt. McKinley and Mt. Logan? 134 m

Math Streams

Find the last number. Use a calculator.



39

Extra Practice

Find the difference.

1. $\begin{array}{r} 7124 \\ - 3786 \\ \hline 3338 \end{array}$
2. $\begin{array}{r} 90105 \\ - 6912 \\ \hline 83193 \end{array}$
3. $\begin{array}{r} 29478 \\ - 19575 \\ \hline 9903 \end{array}$
4. $\begin{array}{r} 50020 \\ - 986 \\ \hline 49034 \end{array}$
5. $7412 - 6424$ 988
6. $9001 - 5762$ 3239
7. $9000 - 2316$ 6684
8. between 3509 and 848 2661
9. between 21324 and 9655 11669
10. between 10000 and 1895 8105

Round to the nearest thousand. Write the estimated difference.

11. $6526 - 3417$ $7000 - 3000 = 4000$
12. $8777 - 2113$ $9000 - 2000 = 7000$
13. $7795 - 3408$ $8000 - 3000 = 5000$

Solve.

A jet is flying at an altitude of 11 500 m above sea level over a mountain peak that is 2478 m high. How much higher is the plane than the top of the mountain? 9022 m

Assigning the Practice

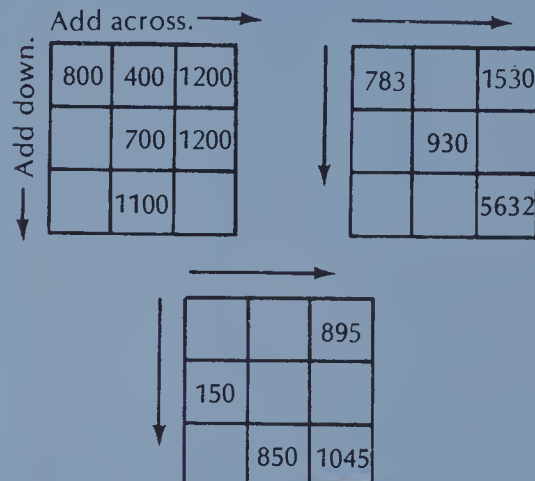
Minimum: 1-4, 9-17

Average: 1-17

Enriched: 1-17

Reinforcement

1. Assign *Math Streams* at the bottom of page 39. All students should be able to do this with a calculator.
2. Have the students find the missing numbers.



Encourage the students to make similar puzzles. Students can then exchange puzzles and solve.

Enrichment

Have the students study the following display and find the differences suggested by the patterns below.

9463	6782	4972
7345	5356	4726
5983	3781	2784

- a. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- b. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- c. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- d. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- e. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- f. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- g. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- h. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- i. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$
- j. $\begin{array}{r} \square \\ - \square \\ \hline \end{array}$

UNIT 2 LESSON 8

Objective M2

Subtract with money.

Introducing the Lesson

Set up a store in the classroom. Display several articles with price tags. Have play coins and bills available. Ask someone to buy something. After the money is paid for the article, hand back the change *without* counting it aloud. Repeat this purchasing procedure a few more times, occasionally giving out the *wrong* change. See if any buyers notice the error. Begin a discussion which emphasizes the need for counting the change as it is given to the buyer.

Teaching the Lesson

Refer the class to the purchasing situation given at the top of page 40. Have two students act out the counting of the \$1.35 change from \$10.00. Work through the subtraction problem at the chalkboard. Recall the need for lining up the decimal points. Make sure everyone understands how to regroup 10 dollars as 9 dollars (ones), 9 dimes (tenths), and 10 pennies (hundredths). Give several students bills with which they can buy articles at the classroom store. Ask other students to take turns as the sellers. As each item in the store is purchased, the seller writes the appropriate subtraction on the chalkboard and then counts out the change. Give as many students as possible a chance to be the seller.

Review the two ways cents can be written. Stress especially amounts lower than ten cents.

135¢ or \$1.35
87¢ or \$0.87
5¢ or \$0.05

Practice can also be given in using the fewest coins when giving change.

19¢ — 1 dime, 1 nickel, 4 pennies
or 6 coins

Making Change

John bought a souvenir T-shirt when he was on holiday in Toronto. If the T-shirt cost \$8.65, what was his change from a ten-dollar bill?



$$\begin{array}{r} 9 \ 9 \ 10 \\ \$10.00 \\ - \ 8.65 \\ \hline \$1.35 \end{array}$$

The cashier gave this change:

\$ 8.65

8.75 — one dime

9.00 — one quarter

10.00 — one dollar



Total change = \$1.35

EXERCISES

For each amount spent, find the fewest coins to give change from \$1.00.

- | | | | | |
|--------|--------|--------|--------|---------|
| 1. 97¢ | 2. 95¢ | 3. 90¢ | 4. 75¢ | 5. 86¢ |
| 6. 71¢ | 7. 39¢ | 8. 29¢ | 9. 64¢ | 10. 45¢ |

For each amount spent, find the change from \$5.00 using the fewest coins and bills.

- | | | | | |
|------------|------------|------------|------------|------------|
| 11. \$4.00 | 12. \$4.25 | 13. \$3.50 | 14. \$3.75 | 15. \$1.25 |
| 16. \$3.98 | 17. \$3.47 | 18. \$2.60 | 19. \$1.63 | 20. 95¢ |

Subtract.

- | | | | | |
|---|--|---|---|--|
| 21. $\begin{array}{r} \$5.00 \\ - \ 2.35 \\ \hline \$2.65 \end{array}$ | 22. $\begin{array}{r} \$5.75 \\ - \ 2.35 \\ \hline \$3.40 \end{array}$ | 23. $\begin{array}{r} \$7.75 \\ - \ 2.89 \\ \hline \$4.86 \end{array}$ | 24. $\begin{array}{r} \$8.53 \\ - \ 2.65 \\ \hline \$5.88 \end{array}$ | 25. $\begin{array}{r} \$25.50 \\ - \ 9.95 \\ \hline \$15.55 \end{array}$ |
| 26. $\begin{array}{r} \$16.95 \\ - \ 7.48 \\ \hline \$9.47 \end{array}$ | 27. $\begin{array}{r} \$20.00 \\ - \ 18.67 \\ \hline \$1.33 \end{array}$ | 28. $\begin{array}{r} \$23.40 \\ - \ 11.27 \\ \hline \$12.13 \end{array}$ | 29. $\begin{array}{r} \$18.95 \\ - \ 9.23 \\ \hline \$9.72 \end{array}$ | 30. $\begin{array}{r} \$22.63 \\ - \ 14.89 \\ \hline \$7.74 \end{array}$ |

40

Using the Exercises

- Questions 1 to 10 require the student to name the fewest coins as the change from \$1.00.
- Questions 11 to 20 require the naming of the fewest coins and bills as the change from \$5.00. For extra emphasis, do these questions together and ask the students to act out each change-giving situation.
- Questions 21 to 30 give practice in subtracting money numbers.

PRACTICE

Subtract.

- | | | | |
|---|---|--|---|
| 1. $\begin{array}{r} \$4.25 \\ - 3.98 \\ \hline \$0.27 \end{array}$ | 2. $\begin{array}{r} \$6.05 \\ - 4.35 \\ \hline \$1.70 \end{array}$ | 3. $\begin{array}{r} \$12.50 \\ - 6.79 \\ \hline \$5.71 \end{array}$ | 4. $\begin{array}{r} \$18.10 \\ - 12.56 \\ \hline 5.54 \end{array}$ |
| 5. $\begin{array}{r} \$5.00 \\ - 2.88 \\ \hline \$2.12 \end{array}$ | 6. $\begin{array}{r} \$2.00 \\ - 0.56 \\ \hline \$1.44 \end{array}$ | 7. $\begin{array}{r} \$10.00 \\ - 6.25 \\ \hline \$3.75 \end{array}$ | 8. $\begin{array}{r} \$20.00 \\ - 15.99 \\ \hline \$4.01 \end{array}$ |

For each amount spent, find the change from \$2.00.

- | | | | |
|------------------|-------------------|-------------------|----------------|
| 9. \$1.25 $75¢$ | 10. \$1.08 $92¢$ | 11. \$0.95 1.05 | 12. 65¢ 1.35 |
| 13. \$1.52 $48¢$ | 14. \$0.69 1.31 | 15. 35¢ 1.65 | 16. 78¢ 1.22 |

For each amount spent, find the change from \$20.00.

- | | | | |
|--------------------|-------------------|--------------------|--------------------|
| 17. \$13.75 6.25 | 18. \$19.25 $75¢$ | 19. \$8.56 11.44 | 20. \$4.39 15.61 |
| 21. \$0.85 19.15 | 22. 92¢ 19.08 | 23. 57¢ 19.43 | 24. 5¢ 19.95 |

John bought the following items when he was on holiday in Toronto. How much change would he receive if he paid for each with a \$10.00 bill?

- | | |
|----------------------------------|--------|
| 25. movie theatre ticket, \$4.50 | 5.50 |
| 26. bus ride, 65¢ | 9.35 |
| 27. baseball game ticket, \$8.95 | 1.05 |
| 28. roller skate rental, \$3.75 | 6.25 |

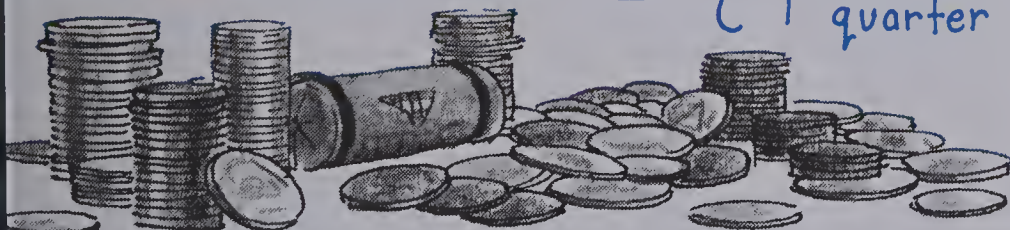
Coin Question

Find a way to make a dollar's worth of change that uses exactly 50 coins.

40 pennies, 8 nickels, 2 dimes

OR

45 pennies
2 dimes
2 nickels
1 quarter



41

Extra Practice

Worksheet M2

Pages 40-41

For each amount spent, find the fewest coins and bills needed to give change from \$10.00.

- | | | |
|------------------|------------------|------------------|
| 1. \$1.49 8.51 | 2. \$7.75 2.25 | 3. \$5.15 4.85 |
|------------------|------------------|------------------|

For each amount spent, find the change from \$100.00.

- | | | |
|--------------------|-------------------|--------------------|
| 4. \$59.95 40.05 | 5. \$92.35 7.65 | 6. \$89.95 10.05 |
|--------------------|-------------------|--------------------|

ve.

Mr. Rossi spent \$35.25 on a sweater and \$19.89 on a shirt. What is his change from \$60.00? 4.86

Marlene spent \$11.59 on aquarium fish. She received \$8.41 in change. How much money did she give the clerk? 20

Assigning the Practice

Minimum: even numbers

Average: 1-26

Enriched: 3-28

Reinforcement

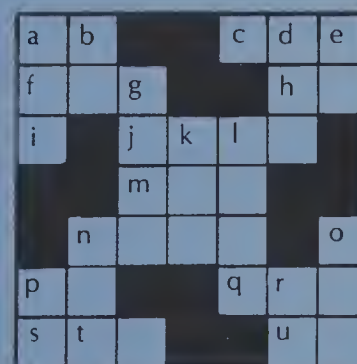
1. Assign *Coin Question* at the bottom of page 41. Some students may prefer to work with coins to solve the problem.

2. Give each student a play \$100.00 bill. Ask the students to page through a catalog and select three or more articles of clothing that do not total more than \$100.00. See who can spend the most without going over \$100.00.

Enrichment

1. Investigate how to write cheques properly and how to record the balance left in the chequing account. If possible, obtain some blank cheques and deposit slips from your local bank for the students to use. Provide a worksheet to record the deposits and cheques. Set up four or five sample monthly accounts. Have the students write cheques and deposit slips for each account and then find the monthly balances.

2. Prepare the following cross-number puzzle.



ACROSS

- | | | |
|----|------------|--------|
| a. | 127 - 85 | 42 |
| c. | 1145 - 382 | 763 |
| f. | 679 - 298 | 381 |
| h. | 330 - 292 | 38 |
| i. | 275 - 267 | 8 |
| j. | 1920 - 151 | 1769 |
| m. | 1093 - 251 | 842 |
| n. | 2101 - 747 | 1354 |
| o. | 490 - 485 | 5 |
| p. | 170 - 81 | 89 |
| q. | 527 - 131 | 396 |
| s. | 1033 - 247 | 786 |
| u. | 1042 - 988 | 54 |

DOWN

- | | | |
|----|-------------|--------|
| a. | 989 - 551 | 438 |
| b. | 480 - 452 | 28 |
| c. | 878 - 871 | 7 |
| d. | 667 - 28 | 639 |
| e. | 629 - 591 | 38 |
| g. | 7970 - 6787 | 1183 |
| k. | 1611 - 866 | 745 |
| l. | 7379 - 1136 | 6243 |
| n. | 397 - 199 | 198 |
| o. | 970 - 406 | 564 |
| p. | 472 - 385 | 87 |
| r. | 128 - 33 | 95 |
| t. | 50 - 44 | 6 |

Objective A7

Subtract tenths, hundredths, and thousandths.

Introducing the Lesson

Begin a discussion about the things that affect the gas mileage of cars and motorcycles. Infrequent tune-ups, high-speed driving with many stops, frequent acceleration and braking, trailing a heavy load, and rugged terrain with bumps and steep inclines, can all reduce good mileage.

Teaching the Lesson

Refer the class to the Great Slave Lake motorcycle trip mentioned at the top of page 42. Read and discuss the problem, explaining that the trip on the second day over flatter terrain resulted in better gas mileage for the motorcycle. Point out that only one of the three subtractions gives a reasonable number of litres used the first day and the second day. Their difference shows how many more litres of gasoline were needed over the rugged terrain on the first day.

Write the three subtractions on page 42 on the chalkboard and explain the process involved in subtracting each.

$$\begin{array}{r} 15 \text{ ones and } 3 \text{ tenths} \\ \text{are regrouped as} \\ 14 \text{ ones and } 13 \text{ tenths.} \end{array} \quad \begin{array}{r} 1413 \\ \text{15.3} \\ - 9.9 \\ \hline 5.4 \end{array}$$

$$\begin{array}{r} 15.3 \xrightarrow{141210} 15.30 \\ - 0.99 \quad - 0.99 \\ \hline 14.31 \end{array} \quad \begin{array}{l} \text{Annex a zero to} \\ \text{eliminate errors} \\ \text{in subtracting.} \end{array}$$

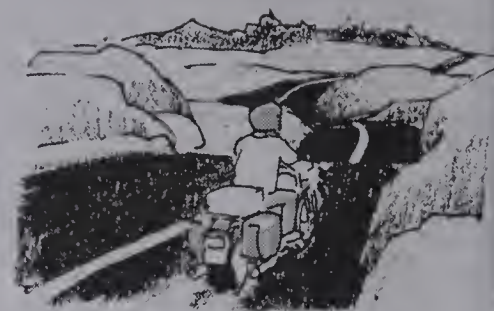
15 ones and 3 tenths are regrouped as 14 ones, 12 tenths, and 10 hundredths.

$$\begin{array}{r} 9.9 \xrightarrow{8910} 9.900 \\ - 0.153 \quad - 0.153 \\ \hline 9.747 \end{array} \quad \begin{array}{l} \text{Annex} \\ \text{zeros.} \end{array}$$

9 ones and 9 tenths are regrouped as 9 ones, 8 tenths, 9 hundredths, and 10 thousandths.

Subtraction of Decimals

Mr. Reimer toured the area near Great Slave Lake on his motorcycle. On the first day he rode through rugged terrain. On the second day the ride was easier. At the end of each day he filled up his gas tank.



Which subtraction below could show how many more litres of gas he used the first day?

$$\begin{array}{r} 15.3 \\ - 0.99 \\ \hline 14.31 \end{array}$$

$$\begin{array}{r} 15.3 \\ - 9.9 \\ \hline 5.4 \end{array}$$

$$\begin{array}{r} 9.9 \\ - 0.153 \\ \hline 9.747 \end{array}$$

EXERCISES

Subtract.

$$\begin{array}{r} 1. \quad 3.0 \\ - 1.9 \\ \hline 1.1 \end{array}$$

$$\begin{array}{r} 2. \quad 3.1 \\ - 1.9 \\ \hline 1.2 \end{array}$$

$$\begin{array}{r} 3. \quad 5.70 \\ - 2.63 \\ \hline 3.07 \end{array}$$

$$\begin{array}{r} 4. \quad 5.7 \\ - 2.63 \\ \hline 3.07 \end{array}$$

$$\begin{array}{r} 5. \quad 4.20 \\ - 1.75 \\ \hline 2.45 \end{array}$$

$$\begin{array}{r} 6. \quad 4.2 \\ - 1.73 \\ \hline 2.47 \end{array}$$

$$\begin{array}{r} 7. \quad 2.600 \\ - 1.895 \\ \hline 0.705 \end{array}$$

$$\begin{array}{r} 8. \quad 2.6 \\ - 1.899 \\ \hline 0.701 \end{array}$$

Subtract. Check by adding.

$$\begin{array}{r} 9. \quad 7.6 \\ - 2.7 \\ \hline 4.9 \end{array}$$

$$\begin{array}{r} 10. \quad 5.0 \\ - 3.18 \\ \hline 1.82 \end{array}$$

$$\begin{array}{r} 11. \quad 12.3 \\ - 9.176 \\ \hline 3.124 \end{array}$$

$$\begin{array}{r} 12. \quad 0.3 \\ - 0.018 \\ \hline 0.282 \end{array}$$

42

Using the Exercises

- Questions 1 to 8 involve the subtraction of tenths, hundredths, and thousandths in examples where it is necessary to annex zeros in the minuend. To aid the students in this process, the problems are paired in such a way that the first one has the zero annexed and the second one does not.
- Questions 9 to 12 require the checking of answers by adding.

PRACTICE

Find the difference.

- | | | | |
|---|---|---|---|
| 1. $\begin{array}{r} 6.5 \\ -3.8 \\ \hline 2.7 \end{array}$ | 2. $\begin{array}{r} 4.11 \\ -2.5 \\ \hline 1.61 \end{array}$ | 3. $\begin{array}{r} 6.5 \\ -5.18 \\ \hline 1.32 \end{array}$ | 4. $\begin{array}{r} 8.9 \\ -1.931 \\ \hline 6.969 \end{array}$ |
| 5. $\begin{array}{r} 0.045 \\ -0.019 \\ \hline 0.026 \end{array}$ | 6. $\begin{array}{r} 7.3 \\ -4.126 \\ \hline 3.174 \end{array}$ | 7. $\begin{array}{r} 0.5 \\ -0.113 \\ \hline 0.387 \end{array}$ | 8. $\begin{array}{r} 46.0 \\ -0.737 \\ \hline 45.263 \end{array}$ |

Subtract. Check by adding.

- | | | | |
|---|--|--|--|
| 9. $\begin{array}{r} 5.7 \\ -1.99 \\ \hline 3.71 \end{array}$ | 10. $\begin{array}{r} 8.0 \\ -0.432 \\ \hline 7.568 \end{array}$ | 11. $\begin{array}{r} 0.9 \\ -0.063 \\ \hline 0.837 \end{array}$ | 12. $\begin{array}{r} 0.072 \\ -0.0019 \\ \hline 0.0701 \end{array}$ |
|---|--|--|--|

Copy and complete. Choose $>$, $=$, or $<$.

13. $8.4 + 9.2$ \bullet $25 - 7.09$ 14. $6.7 + 5.39$ \bullet $19.67 - 7.58$
 15. $43.1 - 0.017$ \bullet $32.59 + 11.01$ 16. $56.9 - 23.45$ \bullet $26.115 + 7.33$

Solve.

17. How much greater is 0.6 than 0.17? 0.43
 18. What is the difference between 7.9 and 7.886? 0.014
 19. How much less is 1.43 than 2? 0.57
 20. Is 4.33 closer to 6.42 or 2.67? 2.67

A New Sign

$=$ means the two sides of the equation are **equal**.

\neq means the two sides of the equation are **not equal**.

Copy and complete. Use $=$ or \neq .

- a. $(27 + 16) + 8$ \bullet $27 + (16 + 8)$ b. $(27 - 16) - 8$ \bullet $27 - (16 - 8)$
 c. $(35 - 12) - 4$ \bullet $35 - (12 - 4)$ d. $(95 + 23) + 18$ \bullet $95 + (23 + 18)$
 e. $(7.2 + 1.5) + 3$ \bullet $7.2 + (1.5 + 3)$ f. $(9 - 4.01) - 1.5$ \bullet $9 - (4.01 - 1.5)$



43

Extra Practice

Find the difference. Check by adding.

- | | | | |
|---|---|--|--|
| 1. $\begin{array}{r} 3.2 \\ -1.24 \\ \hline 1.96 \end{array}$ | 2. $\begin{array}{r} 0.4 \\ -0.175 \\ \hline 0.225 \end{array}$ | 3. $\begin{array}{r} 42.6 \\ -29.82 \\ \hline 12.78 \end{array}$ | 4. $\begin{array}{r} 7.14 \\ -6.957 \\ \hline 0.183 \end{array}$ |
| 5. $2.2 - 0.578 =$ <u>1.622</u> | 6. $54.95 - 3.997 =$ <u>50.953</u> | 7. $28.1 - 19.52 =$ <u>8.58</u> | 8. $16.8 - 7.092 =$ <u>9.708</u> |

Solve.

1. Is 2.78 closer to 5.31 or 0.23? 5.31
 2. What is the difference between 11.1 and 11.01? 0.09
 3. How much greater is 0.7 than 0.523? 0.177
 4. How much less is 26.17 than 27? 0.83

Assigning the Practice

Minimum: 1-12

Average: 1-12, 17-20

Enriched: 5-20

Reinforcement

1. Ask the students to perform the following subtractions.

$\begin{array}{r} 643 \\ -217 \\ \hline \end{array}$	$\begin{array}{r} 64.3 \\ -21.7 \\ \hline \end{array}$	$\begin{array}{r} 6.43 \\ -2.17 \\ \hline \end{array}$	$\begin{array}{r} 0.643 \\ -0.217 \\ \hline \end{array}$
--	--	--	--

Have them identify the pattern and then explain how it works.

2. Ask the students to find the new sales price for each item.

- a. $\begin{array}{r} \$9.38 \\ -\$2.75 \\ \hline \text{off} \end{array}$
 b. $\begin{array}{r} \$14.98 \\ -\$7.30 \\ \hline \text{off} \end{array}$
 c. $\begin{array}{r} \$29.75 \\ -\$11.28 \\ \hline \text{off} \end{array}$
 d. $\begin{array}{r} \$177.18 \\ -\$74.50 \\ \hline \text{off} \end{array}$
 e. $\begin{array}{r} \$2700.39 \\ -\$743.50 \\ \hline \text{off} \end{array}$
 f. $\begin{array}{r} \$4238.97 \\ -\$1187.79 \\ \hline \text{off} \end{array}$

Enrichment

1. Read and discuss the difference between the **equal** and **not equal** signs in A New Sign at the bottom of page 43, before assigning the six questions. As the students are working on the questions, see if anyone can devise a rule for when each sign is used. (The order in which addends are grouped does not affect the sum. Hence, an equal sign can be inserted in the addition problems (a, d, and e). The opposite is true for subtraction.) Point out the sign for the driver at the bottom of the page. It is necessary to perform the operations inside parentheses first.

2. Have the students use a calculator to subtract the following.

What is the pattern?

- | | | |
|---|---|---|
| a. $\begin{array}{r} 0.741 \\ -0.147 \\ \hline \end{array}$ | b. $\begin{array}{r} 0.852 \\ -0.258 \\ \hline \end{array}$ | c. $\begin{array}{r} 0.963 \\ -0.369 \\ \hline \end{array}$ |
|---|---|---|

Objective PS2

Recognize words and phrases associated with addition and subtraction in word problems.

Introducing the Lesson

Set up a sporting goods store in the classroom. Have several kinds of sports equipment with price tags on display. Give the students play bills in larger denominations to pay for their purchases.

Teaching the Lesson

Read and act out the problem at the top of page 44. Discuss the solution by working through the four I.D.E.A. steps (Identify, Decide, Evaluate, Answer). In the Decide step, point out that two operations were needed to solve the problem: first, addition to find the total money spent (already done for the students in the problem); and then subtraction to find the amount of change.

Have the students individually buy two or three items at the store while other students take turns recording the two arithmetical steps at the chalkboard.

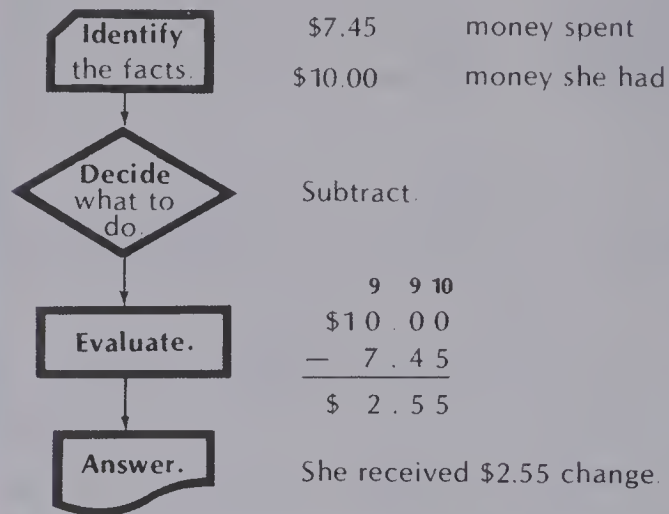
Vary the buying and selling situations by posing these kinds of questions.

- What is the difference in cost of the two balls?
- What is the greatest number of items you could buy for \$15.00?
- How much would you save by buying the wooden rather than the metal tennis racquet?
- Who spent more, Tom or Bill? How much more?
- What is the total cost of all the hockey equipment on display?
- Joan bought these articles for \$7.55. She received \$12.45 in change. How much money did she give the clerk?

In each of the above situations, guide the students in finding the key words or phrases that signify addition or subtraction.

Problem Solving

When she was on holidays, Paula bought a souvenir mug for her grandmother and a book for her sister. She spent \$7.45. What was her change from a \$10 bill?



EXERCISES

Which operation should you use?

- If it costs \$48 a day for a room in a hotel and \$25 a day for meals **\$73** there, what is the cost per day to stay at the hotel? **Addition**
- How much more expensive is a travel tour package that costs \$679.36 than one that costs \$582.87? **\$96.49 Subtraction**
- How much time would you save by taking a 6 h flight rather than taking an 8.5 h flight having 2 stopovers? **2½ h Subtraction**
- The time in Vancouver is 3 h behind the time in Toronto. What time is it in Toronto when it is 6 o'clock in Vancouver? **9 o'clock Addition**
- How long a vacation is needed to spend 4 days travelling, 5 days relaxing, and 2 days shopping? **11 days Addition**

Using the Exercises

- Questions 1 to 5 should be read and discussed as a class, emphasizing the correct choice of operation for solving the problem. The actual solution to the problem can be pointed out, but it is not the main focus of the lesson.

PRACTICE

Solve.

- During their vacation, Simira's family spent \$785.75 for hotel rooms and \$398.64 for food. How much more did they spend for hotel rooms? **\$387.11**
- The time in London, England, is 7 h ahead of the time in Winnipeg. What time is it in Winnipeg when it is noon in London? **05:00**
- Melanie and Keith climbed a 5689 m high mountain starting from a village that had an elevation of 2764 m. How high did they climb? **2925 m**
- Scott and Sandra started their vacation on July 15th and came back on September 5th. How long was their vacation? **52 days**
- During their vacation, Ander's parents spent \$568.43 for hotel rooms, \$327.65 for food, and \$359.52 for gas. What was the cost of their vacation? **\$1255.60**

REVIEW

Subtract.

- | | | | | |
|----|--|---|---|--|
| A5 | 1. $\begin{array}{r} 325 \\ - 88 \\ \hline 237 \end{array}$ | 2. $\begin{array}{r} 940 \\ - 56 \\ \hline 884 \end{array}$ | 3. $\begin{array}{r} 500 \\ - 372 \\ \hline 128 \end{array}$ | 4. $\begin{array}{r} 101 \\ - 29 \\ \hline 72 \end{array}$ |
| A6 | 5. $\begin{array}{r} 3145 \\ - 288 \\ \hline 2857 \end{array}$ | 6. $\begin{array}{r} 5673 \\ - 4189 \\ \hline 1484 \end{array}$ | 7. $\begin{array}{r} 40\ 012 \\ - 9\ 531 \\ \hline 30\ 481 \end{array}$ | 8. $\begin{array}{r} 51\ 009 \\ - 23\ 716 \\ \hline 27\ 293 \end{array}$ |

For each amount spent, subtract to find the change from \$30.00.

- | | | | | |
|----|--|--|---|--|
| M2 | 9. $\begin{array}{r} \$6.95 \\ \hline \$23.05 \end{array}$ | 10. $\begin{array}{r} \$12.50 \\ \hline \$17.50 \end{array}$ | 11. $\begin{array}{r} \$26.99 \\ \hline \$3.01 \end{array}$ | 12. $\begin{array}{r} 89¢ \\ \hline \$29.11 \end{array}$ |
|----|--|--|---|--|

Subtract. Check by adding.

- | | | | | |
|----|---|--|---|---|
| A7 | 13. $\begin{array}{r} 3.2 \\ - 1.78 \\ \hline 1.42 \end{array}$ | 14. $\begin{array}{r} 5.31 \\ - 0.499 \\ \hline 4.811 \end{array}$ | 15. $\begin{array}{r} 27.0 \\ - 1.56 \\ \hline 25.44 \end{array}$ | 16. $\begin{array}{r} 2.0 \\ - 0.018 \\ \hline 1.982 \end{array}$ |
|----|---|--|---|---|

45

Assigning the Practice

Minimum: 1-5

Average: 1-5

Enriched: 1-5

Review Exercises

Questions	Objective	Pages
1-4	A5	36-37
5-8	A6	38-39
9-12	M2	40-41
13-16	A7	42-43

Reinforcement

1. Ask the students to make up a list of words used in problems that indicate that addition is to be used. Have them do the same for words indicating subtraction.

2. Pass out three index cards to each student. Ask them to write one addition, one subtraction, and one addition and subtraction word problem on their cards. Collect the cards, shuffle them, and distribute them for solving.

Enrichment

1. Organize the sale of articles the students have at home and no longer want or need (books, games, sports equipment, etc.) or articles that they have made. Open the sale to your class and other classes in the school.

2. From a sales catalog, have the students make up the following types of problems.

- Addition with money, weight, length, and area
- Subtraction with money, weight, length, and area
- Addition and subtraction with money and weight

Students can exchange problems for solving.

Extra Practice

Worksheet PS2

Pages 44-45

Solve.

Paula delivered papers every morning from June 23 to August 5. For how many days did she deliver papers? **43**

Jack bought a tennis racquet for \$29.98 and a can of tennis balls for \$4.29. How much change did he get from \$35.00? **\$0.73**

Street skates went on sale for \$15.99. How much less is that than the regular price of \$24.98? **\$8.99**

Mrs. Beasley bought a lounge chair for \$12.28. She received \$7.62 change from \$20.00. Was that correct? **No \$7.72**

Problem Solving Activities

Assign Level 6, Unit 2

Unit 2 Objective	Test Questions	Pages
A1	1-4	26-27
A2	5-8	28-29
M1	9-12	30-31
A3	13-16	32-33
A4	17-18	34-35
A5	19-20	36-37
A6	21-24	38-39
M2	25-26	40-41
A7	27-30	42-43
PS	31	

TEST

UNIT 2

Find the sum.

1.

345

+ 62

407

2.

647

+ 938

1585

3.

264

+ 359

623

4.

317

25

+ 811

1153

5.

2613

+ 891

3504

6.

20 516

+ 7 824

28 340

7.

53 172

+ 81 568

134 740

8.

50 183

29

+ 5 164

55 376

9.

\$5.18

+ 0.95

\$6.13

10.

\$48.37

+ 51.29

\$99.66

11.

\$40.32

6.52

+ 12.75

\$59.59

12.

\$19.63

6.75

+ 25.62

\$52.00

13.

3.75

+ 5.2

8.95

14.

49.7

+ 6.845

56.545

15.

2.3

15.49

+ 8.635

26.425

16.

0.74

0.2

+ 0.965

1.905

17.

82 + 6 + 49 + 157

294

18.

5.3 + 28 + 6.25 + 4.126 + 6

49.676

Find the difference.

19.

516

- 77

439

20.

302

- 195

107

21.

7013

- 569

6444

22.

6412

- 3795

2617

23.

40 101

- 8 973

31 128

24.

60 002

- 52 117

7 885

25.

\$6.45

- 1.99

\$4.46

26.

\$50.00

- 27.25

\$22.75

Subtract. Check by adding.

27.

5.1

- 3.9

1.2

28.

6.4

- 0.17

6.23

29.

26.0

- 0.423

25.577

30.

5.0

- 0.19

4.81

Solve.

31.

A travel agency sold \$8765 worth of air tickets in October and \$7995 worth in September. By how much did sales increase in October?

\$770

Post-test

Unit

Find the sum.

1.

342

+ 32

374

2.

736

+ 615

1351

3.

358

+ 295

653

4.

312

91

+ 714

1117

5.

6320

+ 247

6567

6.

42 634

+ 9 173

51 807

7.

84 657

+ 93 748

178 405

8.

57 133

24

+ 6 489

63 646

9.

\$6.19

+ 0.24

\$6.43

10.

\$32.41

+ 38.79

\$71.20

11.

\$41.38

6.23

+ 12.54

\$60.15

12.

\$36.27

1.15

+ 85.20

122.62

13.

6.84

+ 7.9

14.74

14.

82.5

+ 4.657

87.157

15.

7.6

24.83

+ 6.947

39.377

16.

0.12

0.9

+ 0.684

1.704

Write in expanded form.

1. 36 524 2. 7 543 245 3. 62 114 209

Write in standard form.

4. three million one hundred twelve thousand **3 112 000**
 5. nine billion nine hundred sixty-five million **9 965 000 000**
 6. three hundred forty-eight billion **348 000 000 000**

Write the place value of the underlined digit.

7. 3 7 42 165 909 **hundred millions** 8. 99 488 625 173 **ten billions**
 9. 8 547 581 307 **billions** 10. 5 48 329 116 702 **hundred billions**

Copy and complete. Use <, =, or >.

11. 56 194 **<** 56 281 12. 9 999 999 **<** 10 000 001
 13. Round 38 134 to the nearest thousand. **38 000**
 14. Round 5 185 602 to the nearest hundred thousand. **5 200 000**
 15. Round 57 314 685 to the nearest million. **57 000 000**

Write as a decimal in standard form

16. $0.7 + 0.08$ **0.78** 17. $30 + 9 + 0.1 + 0.04$ **39.14**
 18. $6 + 0.5 + 0.09 + 0.008$ **6.598** 19. $0.05 + 0.009 + 0.0008$ **0.0598**
 20. three and forty-eight hundredths **3.48**
 21. five and seventy-five thousandths **5.075**
 22. eleven and four ten-thousandths **11.0004**
 23. $\frac{5}{10}$ **0.5** 24. $\frac{31}{10}$ **3.1** 25. $\frac{23}{100}$ **0.23** 26. $\frac{6}{1000}$ **0.006** 27. $\frac{4}{10\ 000}$ **0.0004**

Copy and complete.

28. $0.2 = 0.\square\square$ **0.20** 29. $4.3 = 4.\square\square\square$ **4.300** 30. $58.\square\square\square = 58.21$ **58.210**

Copy and complete. Use < or >.

31. 3.7 **>** 3.07 32. 6.5 **>** 6.499 33. 5.01 **>** 5.009
 34. Round 1.5756 to the nearest tenth. **1.6**
 35. Round 4.8097 to the nearest hundredth. **4.81**
 36. Round 7.3434 to the nearest thousandth. **7.343**

$38 + 3 + 25 + 461 =$ **527** 18. $5.7 + 24 + 3.14 + 5.213 + 9 =$ **47.053**

Find the difference.

- | | | | |
|------------------------------------|---|---------------------------------------|--|
| 183
- 29
154 | 20. 507
- 148
359 | 21. 5017
- 324
4693 | 22. 5471
- 3916
1555 |
| 50 210
- 9 532
40 678 | 24. 60 006
- 29 117
30 889 | 25. \$6.15
- 3.75
\$2.40 | 26. \$40.00
- 17.65
\$22.35 |

Subtract. Check by adding.

- | | | | |
|----------------------------|----------------------------------|--------------------------------------|----------------------------------|
| 5.3
- 2.8
2.5 | 28. 7.2
- 0.18
7.02 | 29. 95.0
- 0.364
94.636 | 30. 5.0
- 0.39
4.61 |
|----------------------------|----------------------------------|--------------------------------------|----------------------------------|

olve.

At the grocery store, Mr. O'Malley spent \$10.25 on meat, \$4.65 on vegetables, \$2.25 on soft drinks, and \$1.69 on a dessert. How much change did he receive from \$50.00? **\$31.16**

UNIT 3

Multiplication

Theme: Department Store

Lesson	Objective		Pages
Preview		Recall basic multiplication facts.	49
1	A8	Multiply a two-, three-, or four-digit number by a one-digit number.	50-51
2	A9	Multiply a two- or three-digit number by a two-digit number.	52-53
3	A10	Multiply two 3-digit numbers.	54-55
4	A11	Multiply two 3-digit numbers with a zero in the multiplier.	56-57
5	A12	Use exponents to write repeated multiplication.	58-59
6	A13	Estimate products.	60-61
7	M3	Multiply with cents and dollars.	62-63
8	A14	Multiply a one-, two-, or three-digit whole number and a decimal in tenths.	64-65
9	A15	Multiply a one-, two-, or three-digit whole number and a decimal in hundredths.	66-67
10	PS3	Use mental computation to solve simple addition, subtraction, multiplication, and division problems.	68-69
Test		Multiplication	70
Review		Addition and subtraction	71

About This Unit

The aim of this unit is:

1. to review and develop skills in multiplying one-, two-, and three-digit factors;
2. to review and develop skills in multiplying decimals;
3. to develop skills with exponents;
4. to develop estimating and mental computation skills.

This chapter is a review and extension of Grade 5 multiplication. Some concepts, such as multiplying with three-digit factors and exponential numbers, are presented for the first time at this level and will need careful attention. This chapter also goes beyond Grade 5 in developing estimating skills over several lessons.

The theme for the unit is the *Department Store*. The lesson examples, therefore, use this theme to present multiplication situations in real-life settings. The Reinforcement and Enrichment sections of the lessons also follow this theme in their multiplication activities.

Ideas

1. In the earlier grades the students have been taught the basic facts of multiplication. However, not all students will have mastered them. The following are ideas for a review of the basic facts.

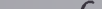
- a. rectangular array

* * * * 3 sets of 4 is 12
 * * * * or, $3 \times 4 = 12$
 * * * *

- b. rectangular region

6

2 rows of 6 is 12
or, $2 \times 6 = 12$



- c. repeated addition

$3 + 3 + 3 + 3 + 3 = 15$
 or, 5 threes are 15
 or, $5 \times 3 = 15$

2. Once the students have mastered the basic facts and have some understanding of place value, the next step is to apply this knowledge in working multiplication algorithms. The following are ideas for providing a multiplication model.

- a. place-value number blocks



There are 3 sets of 35, or 35×3 .

15 cubes can be regrouped as 1 rod and 5 cubes.



Now there are 10 rods and 5 cubes.

10 rods can be regrouped as 1 flat and 0 rods.

$$\begin{array}{r} 100 + 5 \\ 105 \end{array}$$



100s	10s	1s
	1	
	3	5
×		3
1	0	5

- b. rectangular arrays

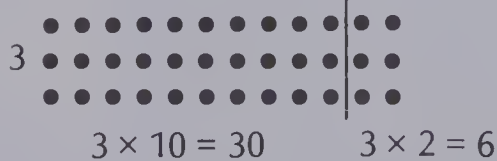
12



Rename 12 as $10 + 2$

10

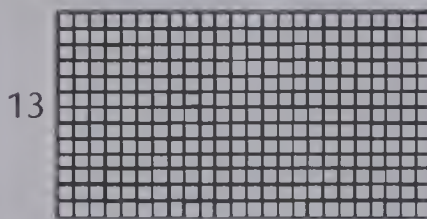
2



$$\begin{array}{r} 10 + 2 \\ \times \quad 3 \\ \hline 6 \\ + 30 \\ \hline 36 \end{array} \longrightarrow \begin{array}{r} 12 \\ \times 3 \\ \hline 36 \end{array}$$

- c. rectangular regions

24



```
rename 13 as 10 + 3
```

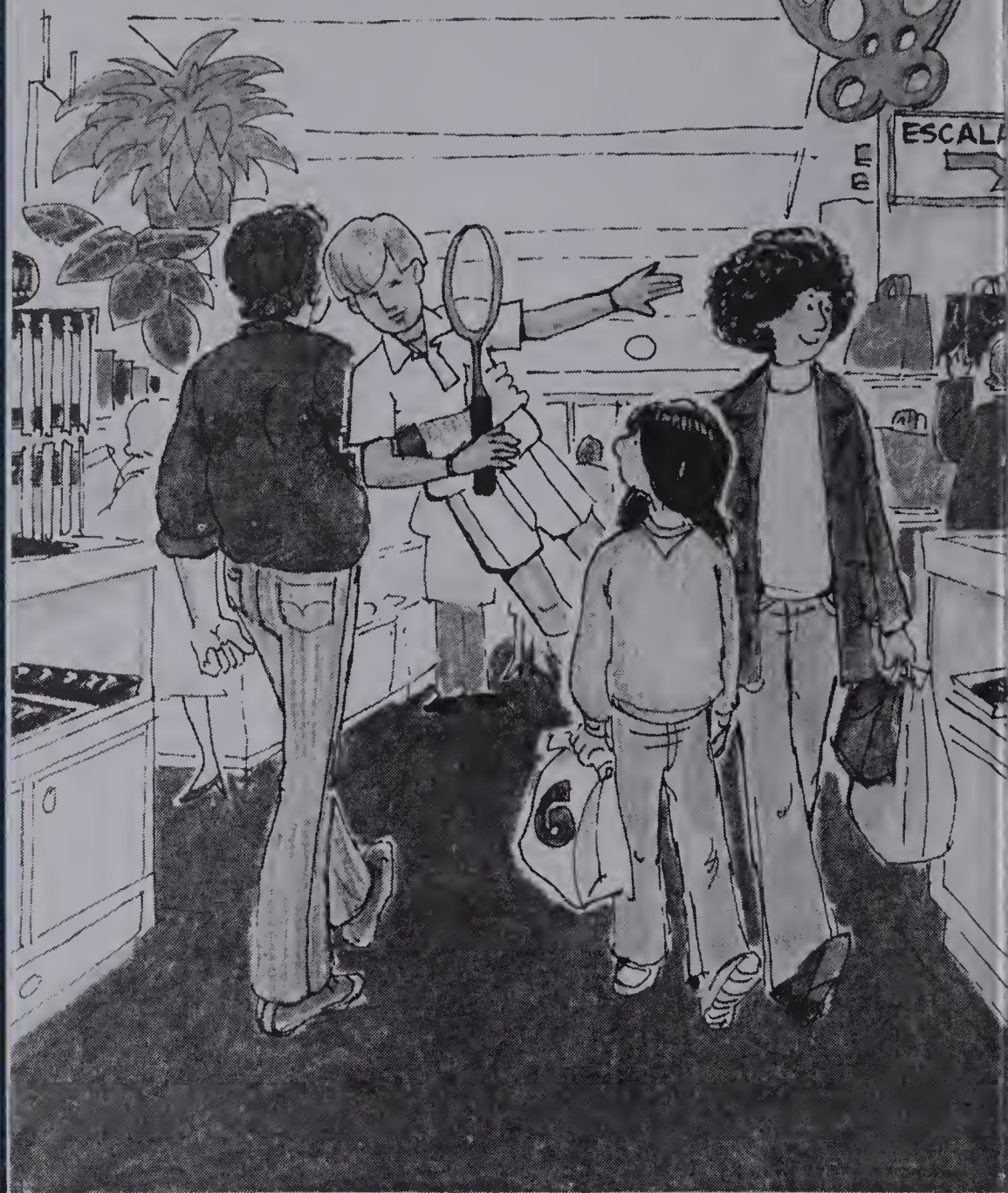
```
rename 24 as 20 + 4
```

	20	4
10	200	40
3	60	12

$$\begin{array}{r}
 20 + 4 \\
 \times 10 + 3 \\
 \hline
 12 \\
 60 \\
 40 \\
 + 200 \\
 \hline
 312
 \end{array}
 \longrightarrow
 \begin{array}{r}
 24 \\
 \times 13 \\
 \hline
 72 \\
 240 \\
 \hline
 312
 \end{array}$$

UNIT 3

MULTIPLICATION



Unit 3 Objective	Test Questions	Pages
A8	1-4	50-51
A9	5-8	52-53
A10	9-12	54-55
A11	13-16	56-57
A12	17-26	58-59
A13	27-29	60-61
M3	30-33	62-63
A14	34-37	64-65
A15	38-41	66-67

Pretest

Unit 3

Find the product.

$$\begin{array}{r} 1. \quad 75 \\ \times 6 \\ \hline 450 \end{array}$$

$$\begin{array}{r} 2. \quad 491 \\ \times 8 \\ \hline 3928 \end{array}$$

$$\begin{array}{r} 3. \quad 658 \\ \times 4 \\ \hline 2632 \end{array}$$

$$\begin{array}{r} 4. \quad 7569 \\ \times 7 \\ \hline 52983 \end{array}$$

$$\begin{array}{r} 5. \quad 45 \\ \times 23 \\ \hline 1035 \end{array}$$

$$\begin{array}{r} 6. \quad 76 \\ \times 94 \\ \hline 7144 \end{array}$$

$$\begin{array}{r} 7. \quad 58 \\ \times 39 \\ \hline 2262 \end{array}$$

$$\begin{array}{r} 8. \quad 586 \\ \times 97 \\ \hline 56842 \end{array}$$

$$\begin{array}{r} 9. \quad 546 \\ \times 732 \\ \hline 399672 \end{array}$$

$$\begin{array}{r} 10. \quad 249 \\ \times 658 \\ \hline 163842 \end{array}$$

$$\begin{array}{r} 11. \quad 503 \\ \times 267 \\ \hline 134301 \end{array}$$

$$\begin{array}{r} 12. \quad 802 \\ \times 579 \\ \hline 464358 \end{array}$$

$$\begin{array}{r} 13. \quad 248 \\ \times 600 \\ \hline 148800 \end{array}$$

$$\begin{array}{r} 14. \quad 764 \\ \times 740 \\ \hline 565360 \end{array}$$

$$\begin{array}{r} 15. \quad 865 \\ \times 602 \\ \hline 520730 \end{array}$$

$$\begin{array}{r} 16. \quad 949 \\ \times 708 \\ \hline 671892 \end{array}$$

Calculate.

$$17. \quad 4^2 = 16 \quad 18. \quad 10^5 = 100\,000 \quad 19. \quad 2^6 = 64 \quad 20. \quad 9^1 = 9$$

Products of Praise

Decode the secret message by matching the letters with the products below.



49

UNIT 3

PREVIEW

Suggestions

Begin a discussion of large department stores. "Which large stores are located near you? How long do you think they have been there? Did department stores exist 100 years ago? Why are they especially needed today?" Ask the class to name as many of the departments as they know of in such a store. List them on the chalkboard. Point out the various functions and services a department store provides for its customers.

About the Page

All students should be able to find the missing products on page 49 without any difficulty. The multiplication facts with 6, 7, 8, and 9 are used most frequently in the problems. Quick recall of these and all the basic multiplication facts is essential for success in this unit.

After the products have been found by the students, the secret message can be decoded as a self-checking device.

Enrichment

Encourage some students to do library research on the history of *The Bay* department store in Canada. Students could present their findings to the class in various ways:

- drawings of the store as it appeared from its beginning to the present, which can be displayed in the classroom;
- oral report;
- written report, which can be displayed in the classroom.

6³ = 216 22. 5² = 25 23. 10⁸ = 100 000 000 24. 3⁴ = 81

2 × 10³ = 2000 25. 8 × 10⁴ = 80 000

Estimate the product.

589 × 47 = 27 683 28. 58 × 6.9 = 400.2 29. \$8.65 × 47 = \$406.55

600 × 50 = 30 000 60 × 7.0 = 420.0 9 × 50 = 450

Multiply.

5¢ × 8 40¢	31. \$0.04 × 2 \$0.08	32. \$6.08 × 32 \$194.56	33. \$27.25 × 76 \$2071.00
3.7 × 8 29.6	35. 98 × 6.2 607.6	36. 49.4 × 703 34 728.2	37. 975 × 80.5 78 487.5
6.88 × 5 34.40	39. 56 × 0.38 21.28	40. 9.06 × 647 5861.82	41. 395 × 4.07 1607.65


UNIT 3 LESSON 1

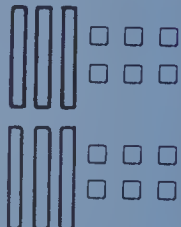
Objective A8

Multiply a one-, two-, three-, or four-digit number by a one-digit number.

Introducing the Lesson

Review multiplication using number blocks. Ask the students to record the multiplication for each model. Stress the regrouping process.

$$\begin{array}{r} 12 \\ \times 2 \\ \hline 24 \end{array}$$


$$\begin{array}{r} 36 \\ \times 2 \\ \hline 72 \end{array}$$


Teaching the Lesson

Refer the class to the sale on chairs shown at the top of page 50. Point out that to find the cost of 3 chairs one could add, since multiplication of whole numbers is repeated addition.

$$189 + 189 + 189 = 567$$

Show also the place-value meaning of the multiplication with number blocks. Have the students practise illustrating and recording several problems involving two-, three-, and four-digit multiplicands. Encourage the students to compute some solutions **mentally**. Explain that it is easier to start with the place having the greatest value when computing mentally.

$$\begin{array}{r} 215 \times 3 = 200 + 10 + 5 \\ \times 3 \\ \hline 600 \\ 30 \\ 15 \\ \hline 645 \end{array}$$

Ask the students to decide on the missing numbers in these examples. As they complete each equation they should realize the *commutativity* and *associativity* of the factors. Students need not be held responsible for the terms at this time.

$$3 \times 57 = \blacksquare \times 3, \quad \blacksquare = 57$$

The *order* changed. The product is not affected.

$$(7 \times 6) \times 5 = 7 \times (\blacksquare \times 5), \quad \blacksquare = 6$$

The *order* is the same, but the *grouping* changed. The product is not affected.

One-Digit Multipliers

Chairs are on sale for \$189. How much would it cost to buy 3?



Cost of 1 chair = \$189

Cost of 3 chairs = \$189 \times 3

$$= \$ (100 + 80 + 9) \times 3$$

Multiply
 3×9 ones.

$$\begin{array}{r} 2 \\ 189 \\ \times 3 \\ \hline 7 \end{array}$$

Multiply
 3×8 tens.

$$\begin{array}{r} 22 \\ 189 \\ \times 3 \\ \hline 67 \end{array}$$

Multiply
 3×1 hundred.

$$\begin{array}{r} 22 \\ 189 \\ \times 3 \\ \hline 567 \end{array}$$

$$\begin{array}{r} 22 \\ 189 \\ \times 3 \\ \hline 567 \end{array}$$

Three chairs would cost \$567.

EXERCISES

Find the product.

1. $\begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array}$

2. $\begin{array}{r} 40 \\ \times 3 \\ \hline 120 \end{array}$

3. $\begin{array}{r} 700 \\ \times 3 \\ \hline 2100 \end{array}$

4. $\begin{array}{r} 745 \\ \times 3 \\ \hline 2235 \end{array}$

5. $\begin{array}{r} 9 \\ \times 8 \\ \hline 72 \end{array}$

6. $\begin{array}{r} 70 \\ \times 8 \\ \hline 560 \end{array}$

7. $\begin{array}{r} 600 \\ \times 8 \\ \hline 4800 \end{array}$

8. $\begin{array}{r} 679 \\ \times 8 \\ \hline 5432 \end{array}$

9. $\begin{array}{r} 26 \\ \times 4 \\ \hline 104 \end{array}$

10. $\begin{array}{r} 37 \\ \times 5 \\ \hline 185 \end{array}$

11. $\begin{array}{r} 693 \\ \times 6 \\ \hline 4158 \end{array}$

12. $\begin{array}{r} 588 \\ \times 3 \\ \hline 1764 \end{array}$

13. $\begin{array}{r} 706 \\ \times 9 \\ \hline 6354 \end{array}$

14. $\begin{array}{r} 508 \\ \times 6 \\ \hline 3048 \end{array}$

15. $\begin{array}{r} 7123 \\ \times 5 \\ \hline 35615 \end{array}$

16. $\begin{array}{r} 6041 \\ \times 7 \\ \hline 42287 \end{array}$

Copy and complete.

17. $6 \times 28 = \blacksquare \times 6$ **28**

18. $4172 \times 3 = 3 \times \blacksquare$ **4172**

19. $(7 \times 6) \times 2 = 7 \times (6 \times \blacksquare)$ **2**

20. $5 \times (8 \times 3) = (5 \times \blacksquare) \times 3$ **8**

Using the Exercises

- Questions 1 to 4 and 5 to 8 break down the question at the end of the row into: first, multiplication of the ones; then of the tens and, finally of the hundreds.
- Questions 9 to 16 give practice with two-, three-, and four-digit multiplicands. Be sure the students multiply Questions 13, 14, and 16 properly since they involve a zero in the multiplicand.
- Questions 17 and 18 require the student to know that a change in the order of the factors does not change the product.
- Questions 19 and 20 are examples of a change in grouping (by way of the parentheses) which also makes a change in the order that the factors are multiplied.

Practice

Find the product.

1. $\begin{array}{r} 24 \\ \times 2 \\ \hline 48 \end{array}$
2. $\begin{array}{r} 37 \\ \times 3 \\ \hline 111 \end{array}$
3. $\begin{array}{r} 58 \\ \times 9 \\ \hline 522 \end{array}$
4. $\begin{array}{r} 631 \\ \times 3 \\ \hline 1893 \end{array}$
5. $\begin{array}{r} 517 \\ \times 4 \\ \hline 2068 \end{array}$
6. $\begin{array}{r} 658 \\ \times 5 \\ \hline 3290 \end{array}$
7. $\begin{array}{r} 926 \\ \times 8 \\ \hline 7408 \end{array}$
8. $\begin{array}{r} 304 \\ \times 2 \\ \hline 608 \end{array}$
9. $\begin{array}{r} 709 \\ \times 6 \\ \hline 4254 \end{array}$
10. $\begin{array}{r} 408 \\ \times 7 \\ \hline 2856 \end{array}$
11. $\begin{array}{r} 6143 \\ \times 2 \\ \hline 12286 \end{array}$
12. $\begin{array}{r} 9542 \\ \times 3 \\ \hline 28626 \end{array}$
13. $\begin{array}{r} 8614 \\ \times 5 \\ \hline 43070 \end{array}$
14. $\begin{array}{r} 7095 \\ \times 8 \\ \hline 56760 \end{array}$
15. $\begin{array}{r} 6004 \\ \times 9 \\ \hline 54036 \end{array}$

Copy and complete.

16. $9 \times 358 = \blacksquare \times 9$ **358**
17. $\blacksquare \times 4 = 4 \times 5716$ **5716**
18. $(8 \times 3) \times \blacksquare = 8 \times (3 \times 5)$ **5**
19. $(7 \times 6) \times 5 = 7 \times (\blacksquare \times 5)$ **6**

Solve.

20. The Boy Scouts bought 5 packages of garbage bags for a litter drive. Each package contained 75 bags. How many bags in all? **375**
21. Ms. Panico bought 3 rolls of wire fencing. Each roll is 2 m high and 35 m long. What is the maximum length that she could fence? **105 m**

Sum of Products

Copy and complete each equation.

Write your answers in order, starting with the least.

- a. $(5 \times 1000) + (4 \times 100) + (7 \times 10) + (2 \times 1) = \blacksquare$ **5472**
- b. $(5 \times 100\,000) + (4 \times 1000) + (7 \times 100) + (2 \times 10) = \blacksquare$ **504720**
- c. $(5 \times 10\,000) + (4 \times 1000) + (7 \times 100) + (2 \times 1) = \blacksquare$ **54702**
- d. $(5 \times 1\,000\,000) + (4 \times 10\,000) + (7 \times 1000) + (2 \times 10) = \blacksquare$ **5047020**

Extra Practice

Find the product.

1. $\begin{array}{r} 67 \\ \times 5 \\ \hline 335 \end{array}$
2. $\begin{array}{r} 397 \\ \times 8 \\ \hline 3176 \end{array}$
3. $\begin{array}{r} 407 \\ \times 6 \\ \hline 2442 \end{array}$
4. $\begin{array}{r} 702 \\ \times 9 \\ \hline 6318 \end{array}$
5. $\begin{array}{r} 7596 \\ \times 5 \\ \hline 37980 \end{array}$
6. $\begin{array}{r} 4839 \\ \times 4 \\ \hline 19356 \end{array}$
7. $\begin{array}{r} 9008 \\ \times 7 \\ \hline 63056 \end{array}$
8. $\begin{array}{r} 3087 \\ \times 8 \\ \hline 24696 \end{array}$

9. $4 \times 375 = 375 \times \underline{4}$
10. $9726 \times 8 = \underline{8} \times 9726$
11. $(6 \times 4) \times 5 = 6 \times (\underline{4} \times 5)$
12. $\underline{7} \times (9 \times 9) = (7 \times 9) \times 9$

Solve.

Mrs. Blake wants a carpet for her hallway that costs \$28 a square metre. If her hallway is 1 m wide by 9 m long, how much should she pay for the carpet? **\$252**

Assigning the Practice

Minimum: 1-15, 20-21

Average: 3-21

Enriched: 6-21

Reinforcement

1. Before assigning *Sum of Products* at the bottom of page 51, discuss and compare the expanded form of numerals as given in Unit 1 to this method. For example, the numeral 2649:

$2000 + 600 + 40 + 9$ (an addition, Unit 1)
 $(2 \times 1000) + (6 \times 100) + (4 \times 10) + (9 \times 1)$
 (a sum of products)

With this understanding, the students can complete the equations.

2. Ask the students the following question, "One freezer costs \$784.00. How much will five cost? Show three different ways you can find the answer."

Enrichment

1. Encourage the students to write several numbers as the sum of products as shown at the bottom of page 51.

- a. 3792 b. 56 249 c. 318 246
- d. 9 885 624 e. 81 005 f. 62 149 873

2. Ask the students to tell whether the pairs of sums and products are equal. They should note that the parentheses tell them what to do first.

- a. product: $5 \times (3 + 2)$,
sum: $(5 \times 3) + (5 \times 2)$
- b. product: $4 \times (5 + 6)$,
sum: $(4 \times 5) + (4 \times 6)$
- c. product: $8 \times (10 + 4)$,
sum: $(8 \times 10) + (8 \times 4)$
- d. product: $4 \times (20 + 6)$,
sum: $(4 \times 20) + (4 \times 6)$

3. Have the students determine which is correct.

- a. $4 + (2 \times 5) = 30$ or $4 + (2 \times 5) = 14$
- b. $9 + (80 \times 2) = 169$ or $9 + (80 \times 2) = 178$

4. Ask the students to use the example given below as a guide as they rewrite each multiplication in a different way.

$$\begin{array}{r} 26 \\ \times 7 \\ \hline \end{array} \longrightarrow 7 \times (20 + 6) = (7 \times 20) + (7 \times 6)$$

- a. $\begin{array}{r} 48 \\ \times 5 \\ \hline \end{array}$
- b. $\begin{array}{r} 97 \\ \times 3 \\ \hline \end{array}$
- c. $\begin{array}{r} 56 \\ \times 7 \\ \hline \end{array}$
- d. $\begin{array}{r} 75 \\ \times 6 \\ \hline \end{array}$

UNIT 3 LESSON 2

Objective A9

Multiply a two- or three-digit number by a two-digit number.

Introducing the Lesson

Review multiplying by multiples of 10. Compute a series of multiplication pairs like these below until the students see that a zero is added onto the product.

$\begin{array}{r} 45 \\ \times 1 \\ \hline 45 \end{array}$	$\begin{array}{r} 45 \\ \times 10 \\ \hline 450 \end{array}$	$\begin{array}{r} 26 \\ \times 2 \\ \hline 52 \end{array}$	$\begin{array}{r} 26 \\ \times 20 \\ \hline 520 \end{array}$	$\begin{array}{r} 48 \\ \times 6 \\ \hline 288 \end{array}$	$\begin{array}{r} 48 \\ \times 60 \\ \hline 2880 \end{array}$
--	--	--	--	---	---

Have the students compute these products as quickly as possible.

$\begin{array}{r} 12 \\ \times 30 \\ \hline \end{array}$	$\begin{array}{r} 22 \\ \times 40 \\ \hline \end{array}$	$\begin{array}{r} 215 \\ \times 20 \\ \hline \end{array}$	$\begin{array}{r} 125 \\ \times 30 \\ \hline \end{array}$
--	--	---	---

Teaching the Lesson

Direct the class to the top of page 52. Read and discuss the problem. Write the multiplication needed for its solution on the chalkboard. Focus attention on how each partial product was obtained.

Point out that the product, 7175, is the sum of two partial products. Stress the adding of the zero to the second partial product, as was practised earlier in the lesson.

Have the students practise several similar examples. Those having difficulty with number alignment should work on graph paper.

Write the multiplication in the text, 205×35 , in several different ways on the chalkboard for the students to compute the products. As they do, let them discover the kinds of changes that were made from the problem at the left.

$205 \times (7 \times 5) \longrightarrow (205 \times 7) \times 5$
(The *grouping* changed. The *order* and the *product* are the same.)

$(41 \times 5) \times (7 \times 5) \longrightarrow (5 \times 5) \times (41 \times 7)$
(The *groups* and *order* changed. The *products* are the same.)

$205 \times 35 \longrightarrow 1025 \times 7$
(One factor is 5 times more. Another factor is 5 times less.)

Two-Digit Multipliers

At a pre-season special sale, 35 pairs of skis were sold at \$205 a pair. How much money did the ski department receive in all for the skis?

$$205 \times 35 = \blacksquare$$

$$205 \times (30 + 5) = \blacksquare$$



Multiply
5 ones $\times 205$

$$\begin{array}{r} 205 \\ \times 35 \\ \hline 1025 \end{array}$$

Multiply
3 tens $\times 205$

$$\begin{array}{r} 205 \\ \times 35 \\ \hline 1025 \\ 6150 \end{array}$$

Add

$$\begin{array}{r} 205 \\ \times 35 \\ \hline 1025 \\ 6150 \\ \hline 7175 \end{array}$$

$$\begin{array}{r} 205 \\ \times 35 \\ \hline 1025 \\ 6150 \\ \hline 7175 \end{array}$$

The ski department received \$7175 in all.

EXERCISES

Find the product.

- | | | | | |
|---|---|--|---|---|
| 1. $\begin{array}{r} 24 \\ \times 2 \\ \hline 48 \end{array}$ | 2. $\begin{array}{r} 24 \\ \times 10 \\ \hline 240 \end{array}$ | 3. $\begin{array}{r} 24 \\ \times 12 \\ \hline 288 \end{array}$ | 4. $\begin{array}{r} 38 \\ \times 7 \\ \hline 266 \end{array}$ | 5. $\begin{array}{r} 38 \\ \times 90 \\ \hline 3420 \end{array}$ |
| 6. $\begin{array}{r} 38 \\ \times 97 \\ \hline 3686 \end{array}$ | 7. $\begin{array}{r} 56 \\ \times 5 \\ \hline 280 \end{array}$ | 8. $\begin{array}{r} 56 \\ \times 70 \\ \hline 3920 \end{array}$ | 9. $\begin{array}{r} 56 \\ \times 75 \\ \hline 4200 \end{array}$ | 10. $\begin{array}{r} 256 \\ \times 75 \\ \hline 19200 \end{array}$ |
| 11. $\begin{array}{r} 43 \\ \times 25 \\ \hline 1075 \end{array}$ | 12. $\begin{array}{r} 97 \\ \times 68 \\ \hline 6596 \end{array}$ | 13. $\begin{array}{r} 343 \\ \times 21 \\ \hline 7203 \end{array}$ | 14. $\begin{array}{r} 702 \\ \times 43 \\ \hline 30186 \end{array}$ | 15. $\begin{array}{r} 655 \\ \times 79 \\ \hline 51745 \end{array}$ |

Copy and complete.

16. $95 \times 56 = 56 \times \blacksquare$ **95**
17. $\blacksquare \times 83 = 83 \times 416$ **416**
18. $(63 \times \blacksquare) \times 25 = 63 \times (2 \times 25)$ **2**
19. $(8 \times 50) \times 33 = 8 \times (50 \times \blacksquare)$ **33**

Using the Exercises

- Questions 1 to 10 develop the process of multiplying by two-digit multipliers. Stress the adding on of the zero when multiplying by a multiple of 10.
- Questions 11 to 15 offer mixed practice. Students having difficulty with number alignment should work on graph paper.
- Questions 16 to 19 give practice with the commutativity and associativity of factors. Students need not be able to name these properties at this time.

PRACTICE

Find the product.

1. $\begin{array}{r} 13 \\ \times 12 \\ \hline 156 \end{array}$
2. $\begin{array}{r} 41 \\ \times 14 \\ \hline 574 \end{array}$
3. $\begin{array}{r} 72 \\ \times 15 \\ \hline 1080 \end{array}$
4. $\begin{array}{r} 68 \\ \times 27 \\ \hline 1836 \end{array}$
5. $\begin{array}{r} 45 \\ \times 66 \\ \hline 2970 \end{array}$
6. $\begin{array}{r} 39 \\ \times 28 \\ \hline 1092 \end{array}$
7. $\begin{array}{r} 64 \\ \times 97 \\ \hline 6208 \end{array}$
8. $\begin{array}{r} 88 \\ \times 49 \\ \hline 4312 \end{array}$
9. $\begin{array}{r} 36 \\ \times 78 \\ \hline 2808 \end{array}$
10. $\begin{array}{r} 47 \\ \times 47 \\ \hline 2209 \end{array}$
11. $\begin{array}{r} 213 \\ \times 13 \\ \hline 2769 \end{array}$
12. $\begin{array}{r} 402 \\ \times 28 \\ \hline 11256 \end{array}$
13. $\begin{array}{r} 576 \\ \times 45 \\ \hline 25920 \end{array}$
14. $\begin{array}{r} 809 \\ \times 27 \\ \hline 21843 \end{array}$
15. $\begin{array}{r} 562 \\ \times 33 \\ \hline 18546 \end{array}$

Copy and complete.

16. $55 \times 79 = (5 \times \blacksquare) \times 79$ 11
17. $27 \times 267 = 801 \times \blacksquare$ 9
18. $25 \times (898 \times 4) = 100 \times \blacksquare$ 898
19. $(18 \times 23) \times (47 \times 13) = (13 \times 23) \times (9 \times \blacksquare)$ 94

Solve.

20. A store buys 115 ski outfits from a distributor at \$85 each. What is the total cost? \$9775
21. During the winter season, 35 pairs of a new model of ski boots were sold for \$145 a pair. How many dollars worth of ski boots were sold? \$5075

Letter Logic

Each letter stands for a different digit. Rewrite the problems with numerals.

$$\begin{array}{r} VZVZ \\ \times \quad 2 \\ \hline X2X2Z \end{array}$$

$$\begin{array}{r} YZ \\ \times \quad 2 \\ \hline XZZ \end{array}$$

$$\begin{array}{r} YVZ \\ \times \quad V \\ \hline TTVZ \end{array}$$

$$\begin{array}{l} V=6 \quad X=1 \quad Y=5 \\ Z=0 \quad T=3 \end{array}$$

53

Assigning the Practice

Minimum: 1-3, 20-21

Average: 1-15, 20-21

Enriched: 4-21

Reinforcement

1. Provide the following practice in multiplying by a multiple of ten.

×10	
in	out
26	
57	
85	
33	

×30	
in	out
21	
15	
32	
45	

×50	
in	out
13	
27	
85	
64	

×90	
in	out
23	
31	
68	
72	

2. Ask the students to complete the following pairs of multiplications.

- a. $\begin{array}{r} 22 \\ \times 30 \\ \hline \end{array}$ $\begin{array}{r} 22 \\ \times 33 \\ \hline \end{array}$
- b. $\begin{array}{r} 41 \\ \times 20 \\ \hline \end{array}$ $\begin{array}{r} 41 \\ \times 21 \\ \hline \end{array}$
- c. $\begin{array}{r} 35 \\ \times 40 \\ \hline \end{array}$ $\begin{array}{r} 35 \\ \times 45 \\ \hline \end{array}$
- d. $\begin{array}{r} 67 \\ \times 50 \\ \hline \end{array}$ $\begin{array}{r} 67 \\ \times 56 \\ \hline \end{array}$

Enrichment

1. Assign *Letter Logic* at the bottom of page 53. Some students may wish to devise similar problems for others to solve.

2. Have the students complete the following and then look for patterns as they discover the short way of multiplying a two-digit number by 11.

- a. $\begin{array}{r} 12 \\ \times 11 \\ \hline 132 \end{array}$
- b. $\begin{array}{r} 13 \\ \times 11 \\ \hline 143 \end{array}$
- c. $\begin{array}{r} 14 \\ \times 11 \\ \hline \end{array}$
- d. $\begin{array}{r} 15 \\ \times 11 \\ \hline \end{array}$
- e. $\begin{array}{r} 18 \\ \times 11 \\ \hline \end{array}$
- f. $\begin{array}{r} 20 \\ \times 11 \\ \hline \end{array}$
- g. $\begin{array}{r} 22 \\ \times 11 \\ \hline \end{array}$
- h. $\begin{array}{r} 33 \\ \times 11 \\ \hline \end{array}$
- i. $\begin{array}{r} 44 \\ \times 11 \\ \hline \end{array}$
- j. $\begin{array}{r} 34 \\ \times 11 \\ \hline \end{array}$
- k. $\begin{array}{r} 27 \\ \times 11 \\ \hline \end{array}$
- l. $\begin{array}{r} 45 \\ \times 11 \\ \hline \end{array}$

Extra Practice

Find the product.

1. $\begin{array}{r} 65 \\ \times 39 \\ \hline 2535 \end{array}$
2. $\begin{array}{r} 47 \\ \times 84 \\ \hline 3948 \end{array}$
3. $\begin{array}{r} 98 \\ \times 36 \\ \hline 3528 \end{array}$
4. $\begin{array}{r} 45 \\ \times 78 \\ \hline 3510 \end{array}$
5. $\begin{array}{r} 608 \\ \times 29 \\ \hline 7632 \end{array}$
6. $\begin{array}{r} 973 \\ \times 47 \\ \hline 45731 \end{array}$
7. $\begin{array}{r} 668 \\ \times 95 \\ \hline 63460 \end{array}$
8. $\begin{array}{r} 475 \\ \times 86 \\ \hline 40850 \end{array}$

Copy and complete.

9. $73 \times \underline{49} = 49 \times 73$
10. $\underline{37} \times 19 = 19 \times 37$
11. $35 \times (\underline{62} \times 21) = (35 \times 62) \times 21$
12. $(88 \times 43) \times 62 = 88 \times (\underline{43} \times 62)$

Worksheet A9

Pages 52-53

UNIT 3 LESSON 3

Objective A10

Multiply two 3-digit numbers.

Introducing the Lesson

Review multiplying by multiples of 100. Compute a series of multiplication pairs like these below until the students notice that in the second case two zeros are added onto the product of the first case.

$\begin{array}{r} 385 \\ \times 1 \\ \hline 385 \end{array}$	$\begin{array}{r} 385 \\ \times 100 \\ \hline 38\ 500 \end{array}$	$\begin{array}{r} 132 \\ \times 3 \\ \hline 396 \end{array}$	$\begin{array}{r} 132 \\ \times 300 \\ \hline 39\ 600 \end{array}$
--	--	--	--

Ask the students to complete these products as quickly as possible.

$\begin{array}{r} 126 \\ \times 20 \\ \hline \end{array}$	$\begin{array}{r} 126 \\ \times 200 \\ \hline \end{array}$	$\begin{array}{r} 431 \\ \times 30 \\ \hline \end{array}$	$\begin{array}{r} 431 \\ \times 300 \\ \hline \end{array}$
$\begin{array}{r} 212 \\ \times 40 \\ \hline \end{array}$	$\begin{array}{r} 212 \\ \times 400 \\ \hline \end{array}$	$\begin{array}{r} 134 \\ \times 50 \\ \hline \end{array}$	$\begin{array}{r} 134 \\ \times 500 \\ \hline \end{array}$

Teaching the Lesson

Refer the class to the problem situation described at the top of page 54. Write the multiplication needed for the solution on the chalkboard. Explain how each of the three **partial products** is found.

$$\begin{array}{r} 948 \\ \times 296 \\ \hline \end{array}$$

partial products $\left\{ \begin{array}{l} 5\ 688 \leftarrow 6 \times 948 \\ 85\ 320 \leftarrow 90 \times 948 \\ 189\ 600 \leftarrow 200 \times 948 \end{array} \right.$

280 608

Explain how one zero is added to the second partial product because a multiple of ten was the multiplier and two zeros were added to the third partial product because a multiple of a hundred was the multiplier. For additional practice, write nine similar problems (three at a time) on the chalkboard. Divide the class into three groups. While Group A does the first three problems on paper, Group B does them at the chalkboard, and Group C does them on calculators. For the next two sets of three problems, the groups switch so that they all will have worked the multiplications in the three different ways.

Three-Digit Multipliers

A downtown department store had an average of 948 customers per day all year. If there are 296 shopping days in a year, how many customers came to the store during the year?

$$948 \times 296 = \blacksquare$$

$$948 \times (200 + 90 + 6) = \blacksquare$$



Multiply
6 ones $\times 948$

$$\begin{array}{r} 24 \\ 948 \\ \times 296 \\ \hline 5688 \end{array}$$

Multiply
9 tens $\times 948$

$$\begin{array}{r} 47 \\ 948 \\ \times 296 \\ \hline 5688 \\ 85320 \end{array}$$

Multiply
2 hundreds $\times 948$

$$\begin{array}{r} 1 \\ 948 \\ \times 296 \\ \hline 5688 \\ 85320 \\ 189600 \end{array}$$

Add

$$\begin{array}{r} 948 \\ \times 296 \\ \hline 5688 \\ 85320 \\ 189600 \\ \hline 280608 \end{array}$$

280 608 customers came to the store during the year.

EXERCISES

Find the product.

- | | | | |
|---|---|---|---|
| 1. $\begin{array}{r} 538 \\ \times 4 \\ \hline 2152 \end{array}$ | 2. $\begin{array}{r} 538 \\ \times 20 \\ \hline 10\ 760 \end{array}$ | 3. $\begin{array}{r} 538 \\ \times 100 \\ \hline 53\ 800 \end{array}$ | 4. $\begin{array}{r} 538 \\ \times 124 \\ \hline 66\ 712 \end{array}$ |
| 5. $\begin{array}{r} 957 \\ \times 2 \\ \hline 1914 \end{array}$ | 6. $\begin{array}{r} 957 \\ \times 30 \\ \hline 28\ 710 \end{array}$ | 7. $\begin{array}{r} 957 \\ \times 600 \\ \hline 574\ 200 \end{array}$ | 8. $\begin{array}{r} 957 \\ \times 632 \\ \hline 604\ 824 \end{array}$ |
| 9. $\begin{array}{r} 605 \\ \times 243 \\ \hline 147\ 015 \end{array}$ | 10. $\begin{array}{r} 702 \\ \times 657 \\ \hline 461\ 214 \end{array}$ | 11. $\begin{array}{r} 908 \\ \times 876 \\ \hline 795\ 408 \end{array}$ | 12. $\begin{array}{r} 407 \\ \times 587 \\ \hline 238\ 909 \end{array}$ |
| 13. $\begin{array}{r} 653 \\ \times 231 \\ \hline 150\ 843 \end{array}$ | 14. $\begin{array}{r} 584 \\ \times 234 \\ \hline 136\ 656 \end{array}$ | 15. $\begin{array}{r} 885 \\ \times 734 \\ \hline 649\ 590 \end{array}$ | 16. $\begin{array}{r} 986 \\ \times 528 \\ \hline 520\ 608 \end{array}$ |

Using the Exercises

- Questions 1 to 16 develop the skill of multiplying with two 3-digit factors. Of these, Questions 1 to 4 and 4 to 8 break down each stage of the process (multiply by the ones, then by the tens, and finally by the hundreds). Students having difficulty with number alignment should do their work on graph paper.

PRACTICE

Find the product.

1. $\begin{array}{r} 432 \\ \times 21 \\ \hline 9072 \end{array}$
2. $\begin{array}{r} 569 \\ \times 32 \\ \hline 18208 \end{array}$
3. $\begin{array}{r} 768 \\ \times 45 \\ \hline 34560 \end{array}$
4. $\begin{array}{r} 586 \\ \times 132 \\ \hline 77352 \end{array}$
5. $\begin{array}{r} 976 \\ \times 121 \\ \hline 118096 \end{array}$
6. $\begin{array}{r} 304 \\ \times 123 \\ \hline 37392 \end{array}$
7. $\begin{array}{r} 708 \\ \times 457 \\ \hline 323556 \end{array}$
8. $\begin{array}{r} 605 \\ \times 621 \\ \hline 375705 \end{array}$
9. $\begin{array}{r} 209 \\ \times 897 \\ \hline 187473 \end{array}$
10. $\begin{array}{r} 707 \\ \times 238 \\ \hline 168266 \end{array}$
11. $\begin{array}{r} 421 \\ \times 322 \\ \hline 135562 \end{array}$
12. $\begin{array}{r} 653 \\ \times 433 \\ \hline 282749 \end{array}$
13. $\begin{array}{r} 857 \\ \times 555 \\ \hline 475635 \end{array}$
14. $\begin{array}{r} 987 \\ \times 658 \\ \hline 649446 \end{array}$
15. $\begin{array}{r} 394 \\ \times 869 \\ \hline 342386 \end{array}$

Solve.

16. An arena has 125 rows of seats with 110 seats in each row. How many seats are there in all? **13 750**
17. Every week, 33 newspapers and 52 magazines are delivered to a popular news stand. How many items are delivered in one year? **4420**
18. What number is 111 times greater than 345? **38 295**

Predictable Products

Use a calculator to find the product. Do the work inside the parentheses first.

- a. $46 \times (117 + 83)$ **9200** $(46 \times 117) + (46 \times 83)$ **9200**
- b. $95 \times (252 + 48)$ **28 500** $(95 \times 252) + (95 \times 48)$ **28 500**
- c. $150 \times (459 + 41)$ **75 000** $(150 \times 459) + (150 \times 41)$ **75 000**
- d. $265 \times (324 + 676)$ **265 000** $(265 \times 324) + (265 \times 676)$ **265 000**

What did you notice about each pair? **same**

() () **(1st)** ()

55

Assigning the Practice

Minimum: even numbers

Average: 1-12, 16-18

Enriched: 4-18

Reinforcement

1. Assign *Predictable Products* at the bottom of page 55. After working the problems with a calculator, students should notice that the answers in each pair of problems are the same.

2. Have the students complete the following table.

\times	10	100	20	200	30	300	40	400
213								
432								
589								

3. Divide the class into teams and play a game involving the multiplication or addition of three-digit numbers.

Before play, each student writes out on a small card a problem like, "What number is 782 times greater than 602?" or "What number is 567 times greater than 489?" The answer is given on the back of the card. All cards are placed in a hat. Play begins as individual team members draw a card and solve the problem. Points are assigned to the team for each correct response.

Enrichment

Show the students grid multiplication. Ask them to study the following example and then calculate products on a grid for other similar multiplications.

			6	3	8	
			1	0	2	3
			8	9	4	
			2	1	3	4
			4	2	2	
			3	1	4	5
			0	5	0	
2	2	0	1	1	0	

Extra Practice

Find the product.

1. $\begin{array}{r} 721 \\ \times 352 \\ \hline 253792 \end{array}$
2. $\begin{array}{r} 601 \\ \times 542 \\ \hline 325742 \end{array}$
3. $\begin{array}{r} 324 \\ \times 697 \\ \hline 225828 \end{array}$
4. $\begin{array}{r} 408 \\ \times 975 \\ \hline 397800 \end{array}$
5. $\begin{array}{r} 497 \\ \times 267 \\ \hline 132699 \end{array}$
6. $\begin{array}{r} 506 \\ \times 967 \\ \hline 489302 \end{array}$
7. $\begin{array}{r} 809 \\ \times 721 \\ \hline 583289 \end{array}$
8. $\begin{array}{r} 948 \\ \times 732 \\ \hline 693936 \end{array}$
9. $\begin{array}{r} 766 \\ \times 528 \\ \hline 404448 \end{array}$
10. $\begin{array}{r} 896 \\ \times 758 \\ \hline 679168 \end{array}$
11. $\begin{array}{r} 398 \\ \times 742 \\ \hline 295316 \end{array}$
12. $\begin{array}{r} 879 \\ \times 986 \\ \hline 866694 \end{array}$

Solve.

- What number is 325 times greater than 463? **150 475**
- What number is 657 more than 973? **1630**
- What number is 448 times greater than 762? **341 376**

UNIT 3 LESSON 4

Objective A11

Multiply two 3-digit numbers with a zero in the multiplier.

Introducing the Lesson

Provide mixed practice with multiplying by ten, multiples of ten, a hundred, and multiples of a hundred.

$\begin{array}{r} 562 \\ \times 10 \\ \hline \end{array}$	$\begin{array}{r} 486 \\ \times 100 \\ \hline \end{array}$	$\begin{array}{r} 311 \\ \times 20 \\ \hline \end{array}$	$\begin{array}{r} 423 \\ \times 300 \\ \hline \end{array}$
$\begin{array}{r} 622 \\ \times 30 \\ \hline \end{array}$	$\begin{array}{r} 475 \\ \times 500 \\ \hline \end{array}$	$\begin{array}{r} 685 \\ \times 60 \\ \hline \end{array}$	$\begin{array}{r} 907 \\ \times 800 \\ \hline \end{array}$

Stress that only the final product needs to be written for each problem. Partial products do not have to be written since they are equal to zero. Explain that when multiplying by ten or a multiple of ten, one zero is added onto the product; and when multiplying by a hundred or a multiple of a hundred, two zeros are added.

Teaching the Lesson

Point out the problem at the top of page 56. Read and discuss the situation. Write the multiplication needed for the solution on the chalkboard. Explain the way each **partial product** is obtained.

$$\begin{array}{r} 298 \\ \times 105 \\ \hline 1490 \leftarrow 5 \times 298 \\ 29800 \leftarrow 100 \times 298 \\ \hline 31290 \end{array}$$

Note that with a three-digit multiplier there should be three partial products. Yet when one of the digits in the multiplier is zero, its partial product can be eliminated, since it is equal to zero. Explain a few other examples at the chalkboard. For example:

$$\begin{array}{r} 624 \\ \times 590 \\ \hline 56160 \leftarrow 90 \times 624 \\ 312000 \leftarrow 500 \times 624 \\ \hline 368160 \end{array}$$

The partial product for 0 ones $\times 624$ need not be written.

Zero in the Multiplier

A large department store pays each of its 105 employees \$298 per week. How much money does the store need each week to pay these salaries?

$$298 \times 105 = \blacksquare$$

$$298 \times (100 + 5) = \blacksquare$$

Multiply
5 ones $\times 298$.

$$\begin{array}{r} 44 \\ 298 \\ \times 105 \\ \hline 1490 \end{array}$$

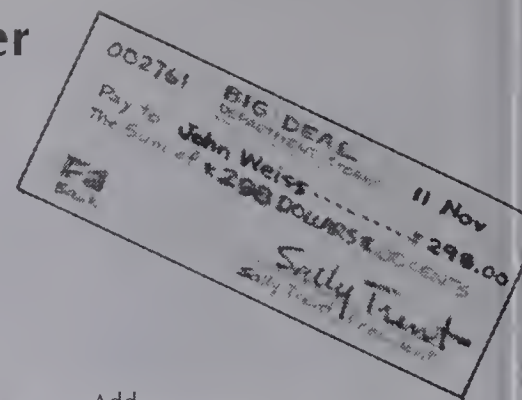
Multiply
1 hundred $\times 298$.

$$\begin{array}{r} 298 \\ \times 105 \\ \hline 1490 \\ 29800 \end{array}$$

Add.

$$\begin{array}{r} 298 \\ \times 105 \\ \hline 1490 \\ 29800 \\ \hline 31290 \end{array}$$

The department store needs \$31 290 each week.



EXERCISES

Find the product.

- | | | | |
|--|---|---|---|
| 1. $\begin{array}{r} 256 \\ \times 100 \\ \hline 25600 \end{array}$ | 2. $\begin{array}{r} 256 \\ \times 106 \\ \hline 27136 \end{array}$ | 3. $\begin{array}{r} 475 \\ \times 100 \\ \hline 47500 \end{array}$ | 4. $\begin{array}{r} 475 \\ \times 107 \\ \hline 50825 \end{array}$ |
| 5. $\begin{array}{r} 342 \\ \times 200 \\ \hline 68400 \end{array}$ | 6. $\begin{array}{r} 342 \\ \times 204 \\ \hline 69768 \end{array}$ | 7. $\begin{array}{r} 123 \\ \times 200 \\ \hline 24600 \end{array}$ | 8. $\begin{array}{r} 123 \\ \times 202 \\ \hline 24846 \end{array}$ |
| 9. $\begin{array}{r} 758 \\ \times 400 \\ \hline 303200 \end{array}$ | 10. $\begin{array}{r} 758 \\ \times 403 \\ \hline 305474 \end{array}$ | 11. $\begin{array}{r} 841 \\ \times 600 \\ \hline 504600 \end{array}$ | 12. $\begin{array}{r} 841 \\ \times 607 \\ \hline 510487 \end{array}$ |

13. Copy and complete the table.

\times	10	100	1000	10 000	100 000
9	90	900	9000	90 000	900 000
58	580	5800	58 000	580 000	5 800 000
317	3170	31 700	317 000	3 170 000	31 700 000

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Using the Exercises

- Questions 1 to 12 are paired to aid the student in multiplying with zeros in the multiplier. Check that students write only the necessary partial products and add on zeros properly.
- Question 13 is a multiplication table which should demonstrate the zero patterns as you multiply by 10, 100, 1000, etc.

PRACTICE

Find the product.

1. $\begin{array}{r} 317 \\ \times 202 \\ \hline 64\ 034 \end{array}$
2. $\begin{array}{r} 653 \\ \times 303 \\ \hline 197\ 859 \end{array}$
3. $\begin{array}{r} 948 \\ \times 440 \\ \hline 417\ 120 \end{array}$
4. $\begin{array}{r} 726 \\ \times 550 \\ \hline 399\ 300 \end{array}$
5. $\begin{array}{r} 645 \\ \times 205 \\ \hline 132\ 225 \end{array}$
6. $\begin{array}{r} 673 \\ \times 800 \\ \hline 538\ 400 \end{array}$
7. $\begin{array}{r} 486 \\ \times 780 \\ \hline 379\ 080 \end{array}$
8. $\begin{array}{r} 965 \\ \times 806 \\ \hline 777\ 790 \end{array}$
9. $\begin{array}{r} 573 \\ \times 670 \\ \hline 383\ 910 \end{array}$
10. $\begin{array}{r} 834 \\ \times 960 \\ \hline 800\ 640 \end{array}$
11. $\begin{array}{r} 275 \\ \times 700 \\ \hline 192\ 500 \end{array}$
12. $\begin{array}{r} 589 \\ \times 902 \\ \hline 531\ 278 \end{array}$

13. Copy and complete the table.

\times	10	100	1000	10 000	100 000
24	240	2400	24 000	240 000	2 400 000
282	2820	28 200	282 000	2 820 000	28 200 000
845	8450	84 500	845 000	8 450 000	84 500 000

First place parentheses around the easier multiplication.
Find the product.

14. $41 \times (50 \times 24100)$
15. $79 \times (25 \times 47900)$
16. $(6 \times 50) \times 123600$
17. $(50 \times 4) \times 275400$
18. $22 \times (5 \times 808800)$
19. $40 \times (8 \times 5)1600$

Solve.

20. During a heat wave, a department store sold 324 air conditioners at \$306 each. How much money did they receive? $\$99\ 144$

USING THE CALCULATOR

Use $<$, $>$, or $=$ for \bullet .

- a. $10 \times 10 \times 10 \bullet 4 \times 4 \times 4 \times 4 \times 4$
- b. $5 \times 5 \times 5 \times 5 \times 5 \bullet 10 \times 10 \times 10 \times 10$
- c. $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \bullet 8 \times 8 \times 8$
- d. $1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \bullet 2 \times 2$
- e. $10 \times 10 \times 10 \times 10 \times 10 \bullet 7 \times 7 \times 7 \times 7 \times 7 \times 7$
- f. $9 \times 9 \times 9 \bullet 3 \times 3 \times 3 \times 3 \times 3 \times 3$

57

Extra Practice

Find the product.

1. $\begin{array}{r} 572 \\ \times 650 \\ \hline 71\ 800 \end{array}$
2. $\begin{array}{r} 368 \\ \times 204 \\ \hline 75\ 072 \end{array}$
3. $\begin{array}{r} 981 \\ \times 900 \\ \hline 882\ 900 \end{array}$
4. $\begin{array}{r} 647 \\ \times 708 \\ \hline 458\ 076 \end{array}$
5. $\begin{array}{r} 845 \\ \times 200 \\ \hline 69\ 000 \end{array}$
6. $\begin{array}{r} 618 \\ \times 790 \\ \hline 488\ 220 \end{array}$
7. $\begin{array}{r} 526 \\ \times 605 \\ \hline 318\ 230 \end{array}$
8. $\begin{array}{r} 903 \\ \times 804 \\ \hline 726\ 012 \end{array}$
9. $\begin{array}{r} 260 \\ \times 730 \\ \hline 39\ 800 \end{array}$
10. $\begin{array}{r} 455 \\ \times 800 \\ \hline 364\ 000 \end{array}$
11. $\begin{array}{r} 397 \\ \times 608 \\ \hline 241\ 376 \end{array}$
12. $\begin{array}{r} 648 \\ \times 700 \\ \hline 453\ 600 \end{array}$

ve.

One week, a department store made out 250 paycheques at \$425 each for its sales clerks, and 18 paycheques for its cashiers at \$450 each. How much did the store spend in one week on these salaries?

$\$114\ 350$

Assigning the Practice

Minimum: 1-15, 20

Average: 5-20

Enriched: 5-20

Reinforcement

1. Ask the students to complete the following multiplication cross number puzzles.

$\times \rightarrow$

8	5	
6	9	

$\times \rightarrow$

4	7	
3	8	

$\times \rightarrow$

2	9	
7	1	

$\times \rightarrow$

5	0	
4	9	

2. Write the following blank multiplication on the chalkboard.

$$\begin{array}{r} \square\square\square \\ \times\square\square\square \\ \hline 190\ 000 \end{array}$$

Give pairs of students three red and three white dice. Ask them to shake the dice, in turn, and make two factors (one with the red dice and one with the white dice) which will yield a product as close as possible to the target product of 190 000. Whoever is closer gets a point. Play continues until someone has ten points.

Enrichment

1. Assign *Using the Calculator* at the bottom of page 57. Encourage the students to estimate first which comparison sign they might use. It might also be pointed out that on some calculators only the equal sign needs to be pressed for each repeated multiplication.

$$4 \times 4 \times 4 = 64 \quad \boxed{4 \times 4 \times 4 =} \quad \text{or} \quad \boxed{4 \times =}$$

(This exercise should help create a need for exponents, a topic in the next lesson.)

2. Have the students become the "payroll department" of a large store. After the number of employees of the store and their hourly salaries have been determined, ask the students to find their weekly salaries. The total payroll expenditure for the store in one week can also be computed.

UNIT 3 LESSON 5

Objective A12

Use exponents to write repeated multiplication.

Introducing the Lesson

Review the idea of multiplication as repeated addition. $2 + 2 + 2 + 2 + 2 + 2$ is more easily written as six twos or 6×2 . Suggest that there is also a need for a simpler way of writing repeated multiplication.

Teaching the Lesson

Read and discuss the problem and its solution at the top of page 58. Explain the terms **base** and **exponent**. Note that the exponent tells how many times the base is multiplied. Point out that the given exponential number is read, "Five to the fourth power". Make a chart of the text problem on the chalkboard showing the number of watches sold each day.

days	watches sold	
1st day	5	or $5^1 = 5$
2nd day	5×5	or $5^2 = 25$
3rd day	$5 \times 5 \times 5$	or $5^3 = 125$
4th day	$5 \times 5 \times 5 \times 5$	or $5^4 = 625$

Explain the way repeated multiplication is shortened by writing it in exponential form.

$5^1 = 5$ multiplied once = 5
 $5^2 = 5$ multiplied twice = 25
 $5^3 = 5$ multiplied three times = 125
 $5^4 = 5$ multiplied four times = 625

Suppose that two watches were sold on the first day and each day the number of watches doubled. Have the students complete a chart that would reflect the amounts sold each day as a repeated multiplication, as an exponential number, and as a product.

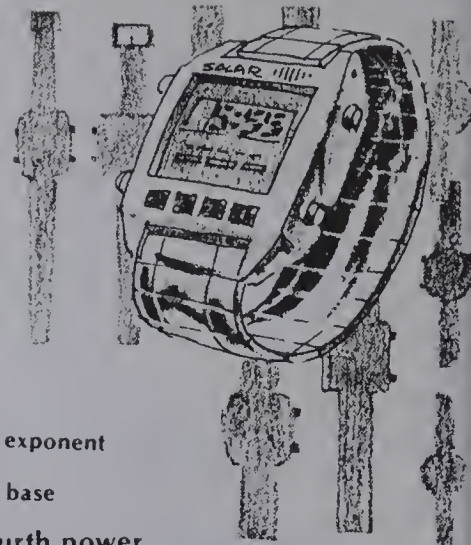
Suppose that 10 watches were sold on the first day and each day the quantity of watches grew 10 times. Write a chart for the powers of 10. Point out the patterns with zeros and exponents.

Show how powers of 10 can be used in place-value expressions.

Exponents

Digital watches went on sale at a large department store. On the first day of the sale, only 5 watches were sold. On the second day, 5 times that many were sold. On the third day, 5 times as many again were sold. On the fourth day, 5 times as many were sold again! What were the total sales on the fourth day?

$5 \times 5 \times 5 \times 5 = 625$ or 5^4
 exponent
 base
 five to the fourth power



EXERCISES

- Write the base numbers: 6^2 , 10^5 , 5^4 , 8^9 .
- Write the exponents: 5^8 , 4^3 , 3^7 , 6^1 .

Copy and complete.

- $3^3 = 3 \times 3 \times 3 = 27$ $3^2 = 3 \times 3 = 9$ $3^1 = 3$
- $6^3 = 6 \times 6 \times 6 = 216$ $6^2 = 6 \times 6 = 36$ $6^1 = 6$
- $5^3 = 5 \times 5 \times 5 = 125$ $5^2 = 5 \times 5 = 25$ $5^1 = 5$
- $9^3 = 9 \times 9 \times 9 = 729$ $9^2 = 9 \times 9 = 81$ $9^1 = 9$
- $4^3 = 4 \times 4 \times 4 = 64$
- $1^5 = 1 \times 1 \times 1 \times 1 \times 1 = 1$
- $2^3 = 2 \times 2 \times 2 = 8$
- $7^2 = 7 \times 7 = 49$
- $10^3 = 10 \times 10 \times 10 = 1000$
- $8^2 = 8 \times 8 = 64$
- $11^2 = 11 \times 11 = 121$
- $10^1 = 10$
- $4^1 = 4$, $4^2 = 16$, $4^3 = 64$
- $2^1 = 2$, $2^2 = 4$, $2^3 = 8$
- $10^1 = 10$, $10^2 = 100$, $10^3 = 1000$, $10^4 = 10000$, $10^5 = 100000$, $10^6 = 1000000$

Write the missing exponent.

- $500 = 5 \times 100$ $500 = 5 \times 10^2$
- $3000 = 3 \times 1000$ $3000 = 3 \times 10^3$
- $90000 = 9 \times 10000$ $90000 = 9 \times 10^4$

Using the Exercises

- Questions 1 and 2 require the students to know the meaning of the terms *base* and *exponent*.
- Questions 3 to 6 give four different bases raised to the first, second, and third powers. See that the students realize that any number raised to the first power is the number itself.
- Questions 7 to 17 develop the meaning of exponents.
- Questions 18 to 20 ask the students to provide the power of ten a place-value expression.
- Watch for difficulties with incorrect transfers such as: $5^4 = 5 \times 4$! Reteach as necessary.

PRACTICE

- Write the base numbers: 3^7 , 5^5 , 8^1 , 10^{10} **3, 5, 8, 10**
- Write the exponents: 2^3 , 5^1 , 12^8 , 6^{12} **3, 1, 8, 12**

Calculate.

- 5^2 **25**
- 10^3 **1000**
- 5^4 **625**
- 9^2 **81**
- 2^4 **16**
- 20^2 **400**
- 3^3 **27**
- 1^4 **1**
- 12^2 **144**
- 6^4 **1296**
- 3^2 **9**
- 6^3 **216**
- 1^7 **1**
- 7^3 **343**
- 40^2 **1600**
- 10^2 **100**
- 16^4 **65 536**
- 10^1 **10**
- 10^6 **1 000 000**
- 10^3 **1 000**

Write the missing exponent.

- $600 = 6 \times 100$
- $9000 = 9 \times 1000$
- $20\ 000 = 2 \times 10\ 000$
- $600 = 6 \times 10^{\square}$ **2**
- $9000 = 9 \times 10^{\square}$ **3**
- $20\ 000 = 2 \times 10^{\square}$ **4**
- $400 = 4 \times 10^{\square}$ **2**
- $7000 = 7 \times 10^{\square}$ **3**
- $50\ 000 = 5 \times 10^{\square}$ **4**

REVIEW

Find the product.

- | | | | | |
|-----|--|--|--|--|
| A8 | 1. 36×4
144 | 2. 517×6
3102 | 3. 308×7
2156 | 4. 9561×8
76 488 |
| A9 | 5. 65×21
1365 | 6. 46×34
1564 | 7. 76×28
2128 | 8. 517×49
25 333 |
| A10 | 9. 435×212
92 220 | 10. 605×247
149 435 | 11. 508×777
394 716 | 12. 649×785
509 465 |
| A11 | 13. 635×200
127 000 | 14. 498×350
174 300 | 15. 217×309
67 053 | 16. 986×709
699 074 |
| A12 | 17. 4^2 16 | 18. 10^5 100 000 | 19. 2^4 16 | 20. 8^3 512 |

59

Assigning the Practice

Minimum: even numbers

Average: 1-28

Enriched: 1-28

Review Exercises

Questions	Objective	Pages
1-4	A8	50-51
5-8	A9	52-53
9-12	A10	54-55
13-16	A11	56-57
17-20	A12	58-59

Reinforcement

- Prepare 16 sets of cards similar to the following. The cards can be used in either of two games with the same rules as "Rummy" or "Fish".

7¹

means 7
multiplied
once

7

8²

means 8
multiplied
twice

64

- Ask the students to write $<$, $=$, or $>$ in each comparison statement.

- | | |
|------------------------------|------------------------------|
| a. $3^2 \blacksquare 2^3$ | b. $4^5 \blacksquare 5^3$ |
| c. $4^2 \blacksquare 2^4$ | d. $6^3 \blacksquare 5^4$ |
| e. $3^3 \blacksquare 4^2$ | f. $2^6 \blacksquare 3^4$ |
| g. $5^3 \blacksquare 3^5$ | h. $10^3 \blacksquare 20^2$ |
| i. $8^2 \blacksquare 2^6$ | j. $10^4 \blacksquare 30^3$ |
| k. $10^3 \blacksquare 100^2$ | l. $100^3 \blacksquare 10^4$ |

Enrichment

- Ask the students to express the following as numbers with exponents in as many ways as possible. For example, $9 = 3^2, 9^1$.

- | | | |
|-------|-------|--------|
| a. 4 | b. 8 | c. 16 |
| d. 25 | e. 27 | f. 32 |
| g. 64 | h. 81 | i. 100 |

- Investigate **squares** and **square roots**. Point out that 5 "squared" is 5^2 or 25. Explain that the opposite of squaring a number is finding the square root. The square root of 25 is 5. It is written: $\sqrt{25}$ is 5. Ask the students to find either the square or the square root.

- | | | | |
|----------------|----------------|----------------|-----------------|
| a. 2^2 | b. $\sqrt{4}$ | c. 8^2 | d. $\sqrt{64}$ |
| e. 1^2 | f. $\sqrt{1}$ | g. 3^2 | h. $\sqrt{9}$ |
| i. 6^2 | j. $\sqrt{36}$ | k. 10^2 | l. $\sqrt{100}$ |
| m. $\sqrt{16}$ | n. 9^2 | o. $\sqrt{49}$ | p. 11^2 |

UNIT 3 LESSON 6

Objective A13

Estimate products.

Introducing the Lesson

Begin a discussion on times when it is beneficial to *estimate*. For example:

- before travelling;
- party planning;
- buying foods.

Have the students relate experiences in which estimating has helped them. Ask the students to recall the rules for rounding as they round the following numbers to the nearest ten, hundred, and thousand: 3056, 2795, 4862.

Teaching the Lesson

Point out the question posed at the top of page 60. After reading and discussing the situation, explain the process of *estimating a product*. Write the text example on the chalkboard and show how each factor is *rounded* to its *first digit*.

$$\begin{array}{r} \$7.89 \\ \times 18 \\ \hline \end{array}$$

7 is the first digit
\$7.89 **rounds up** to \$8.00

$$\begin{array}{r} 18 \\ \times 18 \\ \hline \end{array}$$

1 is the first digit
18 **rounds up** to 20.

Now that the rounding is completed, the cost of the tiles can be estimated.
 $\$8.00 \times 20 = \160.00

Explain that since the Fishers have saved \$175.00, their estimate shows that they have enough money. Write other problems on the chalkboard that require estimating the product.

- 2.2 m of curtain fabric are needed for each of 12 windows. About how many metres is that in all?

2.2 *rounds down* to 2.0

12 *rounds down* to 10

$$2.0 \times 10 = 20 \text{ (estimated product)}$$

- 1.4 m of wood is needed for each of 25 shelves. About how many metres is that in all?

1.4 *rounds down* to 1.0

25 *rounds up* to 30

$$1.0 \times 30 = 30 \text{ (estimated product)}$$

Estimating Products

The Fishers want to tile their kitchen floor. They need 18 boxes of floor tiles. Each box costs \$7.89. Can they buy the tile if they have saved \$175.00?



Estimate the cost first.

Round each number to its first digit.

$$\begin{array}{r} \$7.89 \\ \times 18 \\ \hline \end{array}$$

$$\begin{array}{r} \$8.00 \\ \times 20 \\ \hline \end{array}$$

Multiply.

$$\begin{array}{r} \$8.00 \\ \times 20 \\ \hline \$160.00 \end{array}$$

Estimated cost:
\$160.00

Money saved:
\$175.00

Yes, they have saved enough money.

EXERCISES

Estimate the product.

- $317 \rightarrow 300$
 $\times 25 \rightarrow \times 30$
 $\blacksquare 9000$
- $895 \rightarrow 900$
 $\times 12 \rightarrow \times 10$
 $\blacksquare 9000$
- $422 \rightarrow 400$
 $\times 689 \rightarrow \times 700$
 $\blacksquare 280\ 000$
- $56 \rightarrow 60$
 $\times 3.4 \rightarrow \times 3$
 $\blacksquare 180$
- $21 \rightarrow 20$
 $\times 1.9 \rightarrow \times 2.0$
 $\blacksquare 40.0$
- $43.8 \rightarrow 40$
 $\times 72 \rightarrow \times 70$
 $\blacksquare 2800$
- $\$5.12 \rightarrow \5.00
 $\times 58 \rightarrow \times 60$
 $\blacksquare \$300.00$
- $\$4.95 \rightarrow 5$
 $\times 31 \rightarrow \times 30$
 $\blacksquare \$150$
- $\$62.24 \rightarrow 60$
 $\times 9 \rightarrow \times 10$
 $\blacksquare \$600.00$
- $935 \rightarrow 900$
 $\times 11 \rightarrow \times 10$
 $\blacksquare 9000$
- $7.8 \rightarrow 8$
 $\times 69 \rightarrow \times 70$
 $\blacksquare 560$
- $\$2.99 \rightarrow 3$
 $\times 27 \rightarrow \times 30$
 $\blacksquare \$90.00$
- $\$5.01 \rightarrow 5$
 $\times 21 \rightarrow \times 20$
 $\blacksquare \$100$
- $7.9 \rightarrow 8$
 $\times 4.1 \rightarrow \times 4$
 $\blacksquare 32$

60

Using the Exercises

- Questions 1, 4, and 7 help the students get started with rounding to the first digit and estimating a product. Each row of problems involves a different situation: 1 to 3 involve rounding whole numbers, 4 to 6 involve rounding tenths, and 7 to 9 involve rounding money.
- Questions 10 to 14 include a mixture of the different rounding and estimating situations. Note that *all* products in this lesson are estimated.

PRACTICE

Estimate the product.

- | | | | |
|--|--|--|--|
| 1. $\begin{array}{r} 523 \\ \times 67 \\ \hline 35\ 000 \end{array}$ | 2. $\begin{array}{r} 986 \\ \times 99 \\ \hline 100\ 000 \end{array}$ | 3. $\begin{array}{r} 355 \\ \times 13 \\ \hline 4000 \end{array}$ | 4. $\begin{array}{r} 779 \\ \times 25 \\ \hline 24\ 000 \end{array}$ |
| 5. $\begin{array}{r} 32 \\ \times 1.8 \\ \hline 60 \end{array}$ | 6. $\begin{array}{r} 9.8 \\ \times 7.9 \\ \hline 100 \end{array}$ | 7. $\begin{array}{r} 1.4 \\ \times 16 \\ \hline 20 \end{array}$ | 8. $\begin{array}{r} 67.3 \\ \times 29 \\ \hline 2100 \end{array}$ |
| 9. $\begin{array}{r} \$3.55 \\ \times 41 \\ \hline \$160.00 \end{array}$ | 10. $\begin{array}{r} \$6.25 \\ \times 76 \\ \hline \$480 \end{array}$ | 11. $\begin{array}{r} \$4.09 \\ \times 62 \\ \hline \$240 \end{array}$ | 12. $\begin{array}{r} \$76.77 \\ \times 89 \\ \hline \$7200 \end{array}$ |

Solve.

- Estimate the cost of 3 lawn chairs at \$12.95 a chair. **\$39** ✓
- Estimate the length of wood needed for shelves if each of 9 shelves is 0.75 m. **9 m**
- A box contains 24 packages of flour. Estimate the mass of the contents if each package has a mass of 2.5 kg. **60**
- Estimate the cost of 18 T-shirts at \$7.95 a shirt. **\$160**
- Estimate the number of days in the life of a man who has lived 82 years. **32 000**

Using Your Head

Find the answers to these equations without using a paper and pencil.

- | | |
|--|---|
| a. $3^2 - 8 = \blacksquare$ 1 | b. $(4^3 - 4^2) \times 0 = \blacksquare$ 0 |
| c. $5^3 \times (47 - 47) = \blacksquare$ 0 | d. $(9867 - 9867) + 1^3 = \blacksquare$ 1 |
| e. $7694 \times (10^4 \times 0) = \blacksquare$ 0 | f. $(6^2 \times 0) + 1^9 = \blacksquare$ 1 |



61

Extra Practice

Estimate the product.

- | | | | |
|---|---|--|---|
| 1. $\begin{array}{r} 345 \\ \times 28 \\ \hline 9000 \end{array}$ | 2. $\begin{array}{r} 6.7 \\ \times 2.1 \\ \hline 14 \end{array}$ | 3. $\begin{array}{r} 53.4 \\ \times 47 \\ \hline 2500 \end{array}$ | 4. $\begin{array}{r} \$19.95 \\ \times 52 \\ \hline \$1000 \end{array}$ |
| 5. $\begin{array}{r} 9.8 \\ \times 34 \\ \hline 300 \end{array}$ | 6. $\begin{array}{r} \$46.25 \\ \times 68 \\ \hline \$3500 \end{array}$ | 7. $\begin{array}{r} 7.3 \\ \times 2.9 \\ \hline 21 \end{array}$ | 8. $\begin{array}{r} 6.09 \\ \times 34 \\ \hline 180 \end{array}$ |

Solve.

- Estimate the cost of 54 ball point pens at \$1.89 a pen. **\$100** ✓
- Estimate the number of hours in the life of a three-week-old baby. **400** x
- Twenty-four square metres of broadloom are needed for a floor. **\$600**
- Estimate the cost of the broadloom, if each square metre costs \$28.95.

Assigning the Practice

Minimum: even numbers

Average: 1-10, 13-15

Enriched: 5-17

Reinforcement

1. Plan a classroom party. Decide on the items that are needed. Ask the students to *estimate* the amount of each item needed for the party. For those items that would be purchased, students can estimate the costs.

2. Ask the students to estimate the solutions to the following problems.

a. Five equal-sized parking lots in a city park are filled. Mark counted 189 cars in one lot. Estimate the number of cars in the park.

b. Count the number of students in your class. Estimate the total number of students in the school.

c. The costs for each student on a school field trip are:

- \$2.85 bus
- \$1.10 museum fee
- \$1.80 lunch

Estimate the cost for each student.

Estimate the total cost for 29 students.

Enrichment

1. Assign *Using Your Head* at the bottom of page 61. Try to encourage the students to do each without a paper and pencil. Since the properties of one and zero are used in the problems, each can be easily computed mentally.

2. Investigate the simplest way of solving these problems.

- | | |
|----------------------------------|----------------------------------|
| a. $2^2 \times 2^2 =$ | b. $5^1 \times 5^2$ |
| c. $10^3 \times 10^4 =$ | d. $3^2 \times 3^3 =$ |
| e. $6^2 \times 6^1 =$ | f. $7^2 \times 7^3 =$ |
| g. $1^5 \times 1^6 \times 1^7 =$ | h. $2^3 \times 2^1 \times 2^4 =$ |

UNIT 3 LESSON 7

Objective M3

Multiply with cents and dollars.

Introducing the Lesson

Review repeated addition of cents and dollars, pointing out the placement of the decimal point and the correct label (\$ or ¢) in the sum.

5¢	\$0.02	\$2.10
5¢	0.02	2.10
5¢	+0.02	2.10
+5¢	<u>0.06</u>	2.10
20¢		<u>\$8.40</u>

Point out that these calculations can be more simply written as multiplication.

Teaching the Lesson

Refer the class to the hockey gear for sale at the top of page 62. Read the questions asked and point out that the actual solutions were preceded by an estimate. Show how close the estimates came to the actual costs of the hockey items.

Explain the three situations you will encounter as you multiply money.

1. multiplying cents

8¢	8¢
8¢	or ×3
+8¢	<u>24¢</u>
24¢	

\$0.05	\$0.05
0.05	or × 4
0.05	<u>\$0.20</u>
0.05	
\$0.20	

2. multiplying dollars

\$25	\$25
25	or × 3
+25	<u>\$75</u>
\$75	

3. multiplying dollars and cents

\$1.21	\$1.21
1.21	or × 3
+1.21	<u>\$3.63</u>
\$3.63	

Point out that in each multiplication with dollars and cents there were two places behind the decimal point in the factors and two places behind the decimal point in the products.

Multiplying Money

What is the cost of 4 pairs of skates at \$59.95 a pair?

Estimate.

$$\begin{array}{r} \$60 \\ \times 4 \\ \hline \$240 \end{array}$$



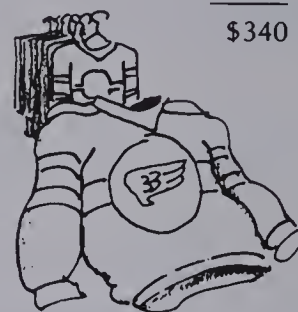
Actual cost.

$$\begin{array}{r} \$59.95 \\ \times 4 \\ \hline \$239.80 \end{array}$$

What is the cost of 17 jerseys at \$19.99 a jersey?

Estimate.

$$\begin{array}{r} \$20 \\ \times 17 \\ \hline \$340 \end{array}$$



Actual cost.

$$\begin{array}{r} \$19.99 \\ \times 17 \\ \hline 139\ 93 \\ 199\ 90 \\ \hline \$339.83 \end{array}$$

EXERCISES

Multiply.

- | | | | | |
|-----------------------------------|---------------------------------------|---|---|---|
| 1. 9¢
× 5
<u>45¢</u> | 2. \$0.09
× 5
<u>\$0.45</u> | 3. 8¢
× 6
<u>48¢</u> | 4. \$0.08
× 6
<u>\$0.48</u> | 5. \$0.80
× 6
<u>\$4.80</u> |
| 6. 28¢
× 7
<u>196¢</u> | 7. \$0.28
× 7
<u>\$1.96</u> | 8. \$2.80
× 7
<u>\$19.60</u> | 9. \$20.80
× 7
<u>\$145.60</u> | 10. \$20
× 7
<u>\$140</u> |
| 11. \$85
× 56
<u>\$4760</u> | 12. \$8.50
× 56
<u>\$476.00</u> | 13. \$80.50
× 56
<u>\$4508.00</u> | 14. \$80.05
× 56
<u>\$4482.80</u> | 15. \$800.50
× 56
<u>\$44828.00</u> |

Estimate first, then find the actual cost.

- | | | |
|---|--|---|
| 16. \$3.59 → \$4
× 12 → × 10
<u>\$43.08</u> | 17. \$16.27 → \$16
× 22 → × 20
<u>\$357.94</u> | 18. \$186.50 → \$200
× 95 → × 100
<u>\$17717.50</u> |
|---|--|---|

Using the Exercises

- Questions 1 to 7 require multiplying cents. The questions are paired so that the cents sign is used in the first question of the pair and the dollar sign in the second.
- Questions 8 to 15 require multiplying with dollars and cents or just dollars. See that the students are able to place correctly either the cents sign or the decimal point and dollar sign in the products.
- Questions 16 to 18 involve finding an estimate of the cost and then the actual cost.

PRACTICE

Multiply.

1. $\begin{array}{r} \$0.08 \\ \times 9 \\ \hline \$0.72 \end{array}$
2. $\begin{array}{r} \$0.04 \\ \times 7 \\ \hline \$0.28 \end{array}$
3. $\begin{array}{r} \$0.75 \\ \times 6 \\ \hline \$4.50 \end{array}$
4. $\begin{array}{r} \$3.64 \\ \times 7 \\ \hline \$25.48 \end{array}$
5. $\begin{array}{r} \$13.64 \\ \times 4 \\ \hline \$54.56 \end{array}$
6. $\begin{array}{r} \$55 \\ \times 20 \\ \hline \$1100 \end{array}$
7. $\begin{array}{r} \$38 \\ \times 15 \\ \hline \$570 \end{array}$
8. $\begin{array}{r} \$2.95 \\ \times 34 \\ \hline \$100.30 \end{array}$
9. $\begin{array}{r} \$6.79 \\ \times 14 \\ \hline \$95.06 \end{array}$
10. $\begin{array}{r} 8.25 \\ \times 75 \\ \hline 618.75 \end{array}$
11. $\begin{array}{r} \$435 \\ \times 12 \\ \hline \$5220 \end{array}$
12. $\begin{array}{r} \$685 \\ \times 200 \\ \hline \$137000 \end{array}$
13. $\begin{array}{r} \$23.68 \\ \times 18 \\ \hline \$426.24 \end{array}$
14. $\begin{array}{r} \$46.79 \\ \times 45 \\ \hline \$2105.55 \end{array}$
15. $\begin{array}{r} 367.52 \\ \times 75 \\ \hline 27564 \end{array}$

Estimate first, then give the actual cost.

16. A four-seat toboggan costs \$32.98. How much would 3 toboggans cost? $\$98.94$
17. Floor hockey sticks cost \$12.95 each. How much would 30 sticks cost? $\$388.50$
18. Running shoes cost \$29.45 a pair. How much would 5 pairs cost? $\$147.25$
19. Soccer balls cost \$42.85 each. How much would 9 soccer balls cost? $\$385.65$

A Wise Choice

Jacob has agreed to cut the grass 12 times. He can choose either of two plans for payment.

- A. \$1.00 for each of the 12 times.
- B. 1¢ for the first time, double 1¢ for the second time, double that for the third time, and so on.

Plan A			Plan B	
	Pay	Total so far	Pay	Total so far
1	\$1.00	\$1.00	\$0.01	\$0.01
2	1.00	2.00	0.02	0.03
3	1.00	3.00	0.04	0.07
4	1.00	4.00	0.08	0.15
5	1.00		0.16	
6				

Complete the chart to see which is the better plan.
Use a calculator.

Choose
plan B

11				
12				
Total after 12 times	\$12.00	Total after 12 times	\$40.96	

63

Assigning the Practice

Minimum: 1-16

Average: 1-19

Enriched: 1-19

Reinforcement

1. Ask a local drive-in restaurant for a classroom set of menu order forms. Divide the class into several groups and have each group check off its order on the order form. Exchange the orders between groups. Then ask the students to calculate the total cost of the order they received.

2. Have the students estimate how much it would cost Mom, Dad, three teenagers, two children, and Grandmother to go to the hockey game. After making an estimate, have them calculate the actual cost.

Hockey ticket prices	
Adult (over 19 yrs.):	\$9.75
Junior (13 to 19 yrs.):	\$6.75
Children (under 13 yrs.):	\$4.95
Senior (over 55 yrs.):	\$4.95

3. Have the students use a sports store catalog to calculate the cost of equipping a 15-player hockey team, a 10-player basketball team, and a 30-player football team.

Enrichment

1. Assign *A Wise Choice* at the bottom of page 63. Encourage guesses as to which is the better choice before beginning the work.

2. Display the following information. Joe has \$175.00.
Skates cost \$52.50 a pair.
Hockey sticks cost \$9.20 each.
Shin pads cost \$12.69 each.
Socks cost \$4.95 a pair.
Hockey pucks cost \$3.25 each.

Ask the students to use this information as they make up five word problems about Joe, his money, and the cost of hockey equipment. Problems can be exchanged with a partner for solving.

Extra Practice

Multiply.

1. $\begin{array}{r} \$6.26 \\ \times 7 \\ \hline \$43.82 \end{array}$
2. $\begin{array}{r} \$52 \\ \times 25 \\ \hline \$1300 \end{array}$
3. $\begin{array}{r} \$0.04 \\ \times 6 \\ \hline \$0.24 \end{array}$
4. $\begin{array}{r} 12\text{¢} \\ \times 8 \\ \hline 96\text{¢} \end{array}$
5. $\begin{array}{r} \$85.23 \\ \times 9 \\ \hline \$767.07 \end{array}$
6. $\begin{array}{r} \$0.07 \\ \times 15 \\ \hline \$1.05 \end{array}$
7. $\begin{array}{r} \$92.68 \\ \times 34 \\ \hline \$3151.12 \end{array}$
8. $\begin{array}{r} \$56.05 \\ \times 47 \\ \hline \$2634.35 \end{array}$

Estimate first, then give the actual cost.

- One fishing rod costs \$62.98. How much would 3 cost? $\$188.94$
- One spool of fishing line costs \$3.38. How much do 12 spools cost? $\$40.56$
- One fishing lure costs \$2.08. How much would 9 lures cost? $\$18.72$
- One box of fish hooks costs \$0.79. What is the cost of 6 boxes? $\$4.74$

Worksheet M3

Pages 62-63

Objective A14

Multiply a one-, two-, or three-digit whole number and a decimal in tenths.

Introducing the Lesson

Provide a drill of multiplying whole numbers (58, 147, 346, 898, etc.) by 10, 100, and 1000 mentally. Discuss how many zeros are added onto the product when multiplying by each. Note, also, that the decimal moves to the right one place when multiplying by 10, to the right two places when multiplying by 100, and to the right three places when multiplying by 1000.

Teaching the Lesson

Point out the fabric purchase of Mr. Wolsky at the top of page 64. Note the way the price was written and have the students recall its meaning. \$12/m means \$12 per metre.

Write the problem on the chalkboard. Estimate the product first.

$$\begin{array}{r} 24.5 \longrightarrow 25 \\ \times \$12 \longrightarrow \times \$10 \\ \hline \$250 \end{array}$$

Explain the computation of the actual cost. Focus on the placement of the decimal point in the product.

$$\begin{array}{r} 24.5 \\ \times 12 \\ \hline 490 \longleftarrow 2 \times 245 \\ 2450 \longleftarrow 10 \times 245 \\ \hline 294.0 \end{array}$$

Note that there is one place behind the decimal point in the factors and one place behind the decimal point in the product.

Display various lengths of ribbon, tape, string, rope, and (if possible) fabric. Assign a price per metre for each in dollars.

Have the students measure each and then estimate and compute the costs.

Multiplying Tenths

Mr. Wolsky bought 24.5 m of fabric to make draperies. The fabric was on sale for \$12/m. How much did he pay for the fabric?

Estimate: $25 \times \$12 = \300

Multiply
2 ones $\times 24.5$.

$$\begin{array}{r} 1 \\ 24.5 \\ \times 12 \\ \hline 490 \end{array}$$

Multiply
1 ten $\times 24.5$.

$$\begin{array}{r} 24.5 \\ \times 12 \\ \hline 490 \\ 2450 \end{array}$$

Add.

$$\begin{array}{r} 24.5 \\ \times 12 \\ \hline 490 \\ 2450 \\ \hline 2940 \end{array}$$

Write the decimal point.

$$\begin{array}{r} 24.5 \\ \times 12 \\ \hline 490 \\ 2450 \\ \hline 294.0 \end{array}$$

Mr. Wolsky paid \$294.00 for the fabric.

EXERCISES

Estimate first, then multiply.

- $2.3 \longrightarrow 2$
 $\times 6 \longrightarrow \times 6$
 13.8 12
- $68.9 \longrightarrow 70$
 $\times 9 \longrightarrow \times 9$
 620.1 630
- $7.9 \longrightarrow \blacksquare 8$
 $\times 4 \longrightarrow \times 4$
 31.6 32
- $3.6 \longrightarrow \blacksquare 4$
 $\times 23 \longrightarrow \times \blacksquare 20$
 82.8 80
- $9.5 \longrightarrow \blacksquare 10$
 $\times 77 \longrightarrow \times \blacksquare 80$
 731.5 800
- $3.2 \longrightarrow \blacksquare 3$
 $\times 98 \longrightarrow \times \blacksquare 100$
 313.6 300

Multiply.

- 20.4
 $\times 323$
 6589.2
- 323
 $\times 20.4$
 6589.2
- 60.5
 $\times 415$
 25107.5
- 415
 $\times 60.5$
 25107.5
- 789
 $\times 60.5$
 47734.5

Copy and complete each table.

12.

\times	0.4	3.8	42.6	184.5
10	4	38	426	1845

13.

\times	6	35	89	679
0.1	0.6	3.5	8.9	67.9

Using the Exercises

- Questions 1 to 6 help the student get started with the process of rounding the factors to the first digit, and estimating the product. Then the exact product is computed.
- Questions 7 to 11 involve multiplications with up to three partial products. See that multiplications with zero in the factors are properly done.
- Questions 12 and 13 require multiplying by 10 and 0.1. Students should notice how these questions can be computed mentally by moving the decimal point.

PRACTICE

Find the product.

1. $5.7 \times 9 = 51.3$
2. $3.8 \times 6 = 22.8$
3. $4.2 \times 5 = 21.0$
4. $59.6 \times 2 = 119.2$
5. $38.7 \times 6 = 232.2$
6. $5.9 \times 68 = 401.2$
7. $68 \times 5.9 = 401.2$
8. $3.5 \times 26 = 91.0$
9. $45 \times 5.7 = 256.5$
10. $9.2 \times 65 = 598.0$
11. $13.4 \times 202 = 2706.8$
12. $202 \times 13.4 = 2706.8$
13. $472 \times 35.8 = 16897.6$
14. $38.9 \times 252 = 9802.8$
15. $753 \times 94.7 = 71309.1$

Copy and complete.

16. $5.3 \times 46 = \blacksquare \times 5.3$ **46**
17. $\blacksquare \times 245 = 245 \times 13.8$
18. $(1.5 \times 3) \times 5 = \blacksquare \times (3 \times 5)$ **1.5**
19. $4 \times (2.5 \times 8) = (4 \times \blacksquare) \times 8$ **2.5**

Copy and complete each table.

20.

\times	0.5	2.9	87.3	655.9
10	5	29	873	6559

21.

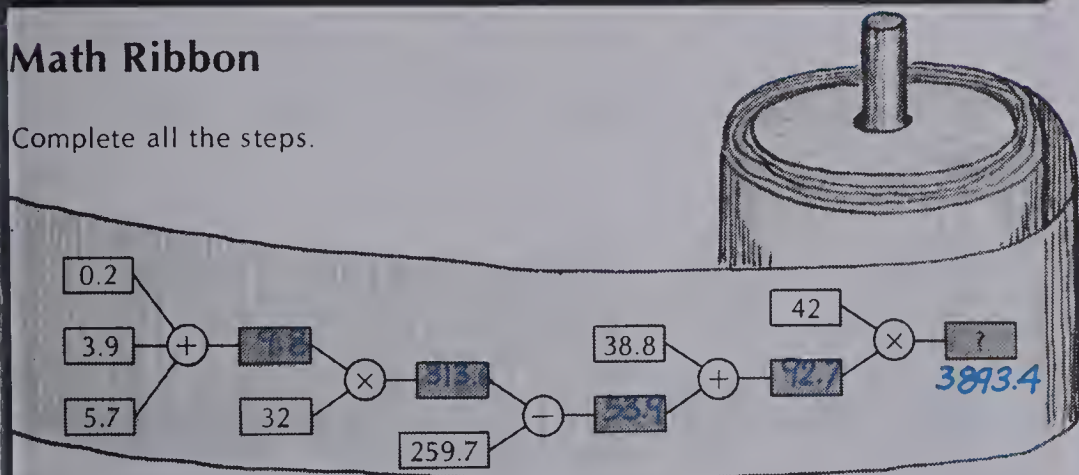
\times	7	94	19	806
0.1	0.7	9.4	1.9	80.6

Estimate first, then solve.

22. How much would 0.7 m of ribbon cost at \$3/m? **\$2.10**
23. Corduroy is \$7/m. What is the cost of 3.5 m? **\$24.50**

Math Ribbon

Complete all the steps.



65

Extra Practice

Find the product.

1. $3.5 \times 4 = 14.0$
2. $6.8 \times 6 = 40.8$
3. $29.7 \times 8 = 237.6$
4. $5.4 \times 23 = 124.2$
5. $7.2 \times 56 = 403.2$
6. $89.6 \times 79 = 7078.4$
7. $625 \times 4.8 = 3000.0$
8. $86.3 \times 576 = 49708.8$
9. $86 \times 0.1 = 8.6$
10. $19.7 \times 10 = 197$
11. $348 \times 0.1 = 34.8$
12. $25.9 \times 10 = 259$

Estimate first, then solve.

- How much would 0.9 m of fringe cost at \$3/m? **\$3**
\$2.70
\$100 + \$8

Mrs. Garcia is making curtains. She bought 18.2 m of fabric at \$5/m and 3.5 m of trim at \$2/m. How much did she spend in all? **\$98.00**

Assigning the Practice

Minimum: 1-15

Average: 1-23

Enriched: 6-23

Reinforcement

1. Write the following chart on the chalkboard and ask the class to find the products and to decide on any patterns formed.

\times	10	1	0.1
9			
14			
367			

Students should recognize that when multiplying by 10 or by 0.1 the product can be found by merely moving the decimal point in the multiplicand to the right or left one place.

2. Assign *Math Ribbon* at the bottom of page 65. All students should be able to complete the steps successfully, as they include addition, subtraction, and multiplication with tenths.

3. Ask the students to solve the following sets of multiplications and investigate the patterns found in the products.

- a. 24×6 2.4×6 24×0.6
 97×8 9.7×8 97×0.8
- b. 73.5×3 73.5×50 73.5×53
 18.6×2 18.6×40 18.6×42
- c. 5×3 5.5×3 6×3 6.5×3
 7×3 7.5×3 8×3 8.5×3
- e. 8×100 8×10 8×1 8×0.1
 49×100 49×10 49×1 49×0.1

Enrichment

Ask the students to study grid multiplication in the example below (32.5×27) and then to find the following products using this method: 48.6×26 , 237.8×83 , 759.4×35 .

		3	2	5	
		0	0	1	2
		6	4	0	7
		2	1	3	
		1	4	5	
	8	7	7	5	

UNIT 3 LESSON 9

Objective A15

Multiply a one-, two-, or three-digit whole number and a decimal in hundredths.

Introducing the Lesson

Write the following multiplication chart on the chalkboard. As the students say the products, point out the pattern found.

\times	1 000	100	10	1	0.1
8	8000	800	80	8	0.8
26	26 000	2600	260	26	2.6
376	376 000	37 600	3760	376	37.6

Have the students decide what the products would be if each of the three numbers were multiplied by 0.01.

Teaching the Lesson

Read and discuss the problem at the top of page 66. Write on the chalkboard the multiplication needed for the solution. Explain how the product may be estimated first.

$$\begin{array}{r} 4.55 \\ \times 15 \\ \hline \end{array} \quad \text{round up to} \quad \begin{array}{r} 5 \\ \times 15 \\ \hline 75 \end{array}$$

Show how the exact product is computed, pointing out the proper placement of the decimal point in the solution. Stress that there are two places behind the decimal point in the factors, so there must be two places behind the decimal point in the solution.

$$\begin{array}{r} 4.55 \\ \times 15 \\ \hline 2275 \leftarrow 5 \times 4.55 \\ 4550 \leftarrow 10 \times 4.55 \\ \hline 68.25 \end{array}$$

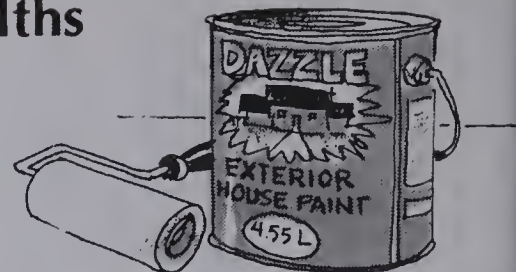
Show that the estimate of 75 L is close to the actual product of 68.25 L.

Provide practice with several other similar problems. Emphasize that multiplying a decimal in hundredths by a whole number always yields a product that is a decimal in hundredths.

Multiplying Hundredths

Ms. Lee bought 15 cans of paint for the exterior of her house and garage. Each can contained 4.55 L of paint. How many litres of paint did she buy?

Estimate: $15 \times 5 = 75$ L



Multiply
5 ones $\times 4.55$

$$\begin{array}{r} 22 \\ 4.55 \\ \times 15 \\ \hline 2275 \end{array}$$

Multiply
1 ten $\times 4.55$

$$\begin{array}{r} 4.55 \\ \times 15 \\ \hline 2275 \\ 4550 \end{array}$$

Add.

$$\begin{array}{r} 4.55 \\ \times 15 \\ \hline 2275 \\ 4550 \\ \hline 6825 \end{array}$$

Write the decimal point.

$$\begin{array}{r} 4.55 \\ \times 15 \\ \hline 2275 \\ 4550 \\ \hline 68.25 \end{array}$$

Ms. Lee bought 68.25 L of paint.

EXERCISES

Estimate first, then multiply.

- $4.22 \rightarrow 4$
 $\times 3 \rightarrow \times 3$
 $\underline{12.66} \quad \underline{12}$
- $0.75 \rightarrow \blacksquare 1$
 $\times 9 \rightarrow \times \blacksquare 10$
 $\underline{6.75} \quad \underline{10}$
- $47.08 \rightarrow \blacksquare 47$
 $\times 8 \rightarrow \times \blacksquare 10$
 $\underline{376.64} \quad \underline{470}$
- $0.83 \rightarrow 1$
 $\times 28 \rightarrow \times 30$
 $\underline{23.24} \quad \underline{28}$
- $0.94 \rightarrow \blacksquare 1$
 $\times 67 \rightarrow \times \blacksquare 70$
 $\underline{62.98} \quad \underline{70}$
- $5.99 \rightarrow \blacksquare 6$
 $\times 12 \rightarrow \times \blacksquare 10$
 $\underline{71.88} \quad \underline{60}$

Multiply.

- $4.06 \times 132 = \underline{535.92}$
- $132 \times 4.06 = \underline{532.92}$
- $3.42 \times 971 = \underline{3320.82}$
- $971 \times 3.42 = \underline{3320.82}$
- $645 \times 2.63 = \underline{1696.35}$

Copy and complete each table.

12.

\times	0.6	4 76	81.38
100	<u>60</u>	<u>476</u>	<u>8138</u>

13.

\times	5	72	90	532
0.01	<u>0.05</u>	<u>0.72</u>	<u>0.9</u>	<u>5.32</u>

Using the Exercises

- Questions 1 to 6 involve rounding the factors to the first digit, estimating the product, and computing the exact product.
- Questions 7 to 11 involve multiplications with up to three partial products. See that the students align the numbers properly.
- Questions 12 and 13 require multiplying by 100 and 0.01. These questions should be computed mentally.

PRACTICE

Find the product.

1. $3.46 \times 2 = 6.92$
2. $9.03 \times 8 = 72.24$
3. $0.58 \times 5 = 2.90$
4. $1.17 \times 9 = 10.53$
5. $54.63 \times 7 = 382.41$
6. $0.59 \times 32 = 18.88$
7. $32 \times 0.59 = 18.88$
8. $23 \times 0.46 = 10.58$
9. $0.79 \times 38 = 30.02$
10. $66 \times 0.73 = 48.18$
11. $7.05 \times 231 = 1628.55$
12. $567 \times 2.04 = 1156.68$
13. $2.16 \times 276 = 596.16$
14. $597 \times 4.83 = 2883.51$
15. $868 \times 4.09 = 3550.12$

Calculate.

16. $5.17 \times 24 = 124.08$
17. $35 \times 6.82 = 238.7$
18. $(1.25 \times 4) \times 6 = 30$
19. $(3 \times 3.05) \times 7 = 64.05$

Copy and complete each table.

20.

\times	0.2	4.23	74.29
100	20	423	7429
10	2	42.3	742.9

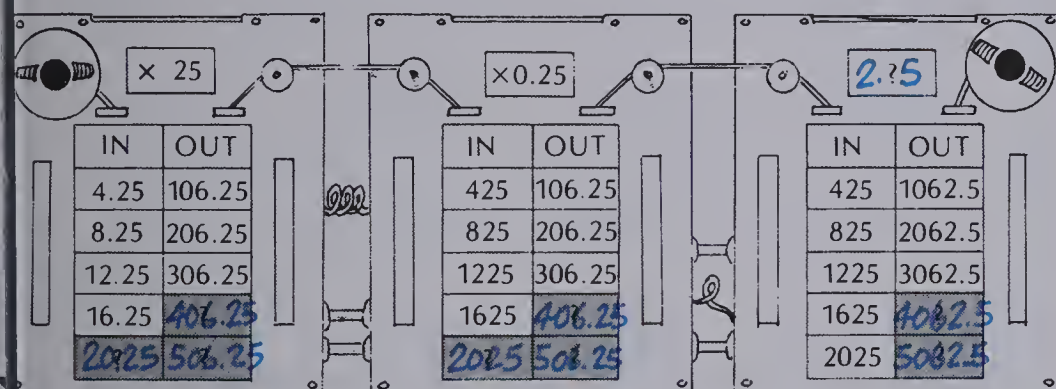
21.

\times	8	43	13	507
0.01	0.08	0.43	0.13	5.07
0.1	0.8	4.3	1.3	50.7

Estimate first, then solve.

22. A can of mahogany wood stain contains 4.19 L.
How many litres are there in 4 cans? 16.76 L

Computer Patterns



67

Assigning the Practice

Minimum: 1-15, 20-21

Average: 1-15, 21-22

Enriched: 6-22

Reinforcement

1. Assign *Computer Patterns* at the bottom of page 67. Students can use a calculator to help them find the patterns.

2. Prepare the following worksheet dot-to-dot puzzle, which gives mixed practice in multiplying decimals in tenths or in hundredths by a whole number. The dots are to be connected in the order of the problems.

1. 56.7×86
2. 0.89×973
3. 124×3.9
4. 567×0.86
5. 625×2.47
6. 786×5.94
7. 97.3×89
8. 1.24×39
9. 78.6×594
10. 62.5×247

• 154.375

1543.75 •

• 4668.84

487.62 •

• 8659.7

• 4836

483.6 •

• 48.36

• 86.597

• 46 688.4

865.97 •

4876.2 •

• 15 437.5



3. Ask the students to write the number of decimal places in each product.

- a. 4×2.7
- b. 42.3×4
- c. 7×8.7
- d. 8.7×16
- e. 9×2.73
- f. 4.84×12

Enrichment

1. Have the students complete the following chart.

\times	1000	100	10	1	0.1	0.01	0.001
4							
17							
73							
492							

2. Ask the students to write $<$, $=$, or $>$ to complete the following comparison statements.

- a. 4×2.3 ■ 3×3.4
- b. 0.1×80 ■ 0.01×80
- c. 7×10 ■ 700×0.1
- d. 50×0.01 ■ 10×0.1
- e. 24×0.01 ■ 12×0.1

Extra Practice

Multiply.

1. $0.67 \times 35 = 23.45$
2. $28 \times 0.58 = 16.24$
3. $0.73 \times 96 = 70.08$
4. $74 \times 0.87 = 64.38$
5. $6.24 \times 126 = 786.24$
6. $846 \times 2.85 = 2411.1$
7. $3.79 \times 582 = 2205.78$
8. $625 \times 7.19 = 4493.75$
9. $3.64 \times 100 = 364$
10. $198 \times 0.01 = 1.98$
11. $0.01 \times 96 = 0.96$
12. $8.45 \times 100 = 845$
13. $37 \times 100 = 3700$
14. $0.01 \times 8 = 0.08$

ve.

A farmer hauled bags of potatoes to market. He hauled eighteen 22.27 kg bags and twenty-five 11.36 kg bags. How many kilograms of potatoes did he haul in all? 684.86 kg

Worksheet A15

Pages 66-67

UNIT 3 LESSON 10

Objective PS3

Use mental computation to solve simple addition, subtraction, multiplication, and division problems.

Introducing the Lesson

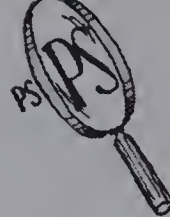
Ask the class to think of word problems requiring addition, subtraction, multiplication, and division. Focus on the operational **key words** that aid the solution of problems.

Teaching the Lesson

Assign the problem-solving quiz on page 68 for a short period of time. Point out how multiple choice questions are answered and how important it is not to guess. Stress that the computations should be done mentally if they wish to finish on time. After the quiz has been completed, discuss each problem in detail so the students can correct their own work. Point out the use of estimation in narrowing the list of possible answers.

Survey the results from each individual student. Determine the kinds of skills each needs to review. Try to help the students become confident in their problem-solving skills so that future difficulties can be avoided.

Solving Problems Mentally



Try to solve each problem mentally.

Write the answer for each.

1. If Judy has \$25, how many \$5 picture frames can she buy?
d a. 125 b. 30 c. 20 d. 5
2. If Jim buys an old coin for \$3 and sells it for \$6, how much does he make?
C a. \$18 b. \$9 c. \$3 d. \$2
3. If Pat earns \$20 in wages and \$5 in tips, how much money does she make?
C a. \$4 b. \$15 c. \$25 d. \$100
4. If Mary buys 4 skirts for \$8 each, how much does she spend?
d a. \$2 b. \$4 c. \$12 d. \$32
5. If Bill's mass is 60 kg and Jill is 30 kg lighter, what is Jill's mass?
b a. 20 kg b. 30 kg c. 60 kg d. 90 kg
6. If John is 40 years old and Sheila is 10 years older, what is Sheila's age?
C a. 30 b. 40 c. 50 d. 60
7. What is the perimeter of a rectangular garden that is 5 m by 6 m?
C a. 11 m b. 30 m c. 22 m d. 60 m
8. If it is 10:00 now, what time will it be 10 h from now?
d a. 15:00 b. 18:00 c. 22:00 d. 20:00
9. How many \$20 bills are needed to pay a debt of \$500?
a a. 25 b. 20 c. 15 d. 30
10. What is the area of a rectangular room that is 3 m by 4 m?
b a. 7 m² b. 12 m² c. 15 m² d. 24 m²

68

Using the Exercises

- Questions 1 to 10 are deliberately simplified so that all computations can be carried out mentally. In this way, the emphasis is on problem-solving rather than on computational skills. Pupils who are poor in mental computation should be provided with calculation aids.

PRACTICE

Mentally compute the answers to these problems.

- How many seats are in an auditorium that contains 25 rows of 10 seats? **250**
- How much does a \$40 hotel room cost with a \$15 discount coupon? **\$25**
- How many tables of 4 are needed to seat 200 people at a dance? **50**
- If today is Wednesday, what day will it be 10 days from now? **Sat.**
- If it is 9 A.M. now, what time will it be 50 hours from now? **11:00**
- What is the volume of a 2 m by 3 m by 4 m room? **24 m^3**
- How much change should you get from a \$5 bill when you are paying for a \$3.80 item? **\$1.20**
- What is the total cost of 99 tickets at 25¢ each? **\$24.75**

REVIEW

Copy and write an estimated product.

- A13 1. 895×12 **900** 2. 3.1×2.8 **3.0** 3. 5.05×78 **\$5** 4. 41.95×41 **\$40**
- $\times 12$ **$\times 10$** $\times 2.8$ **$\times 3.0$** $\times 78$ **$\times 80$** $\times 41$ **$\times 40$**
- 10 740** **9000** **8.68** **9.0** **\$393.90** **\$400** **\$1719.95** **\$1600**

Multiply.

- M3 5. $6\text{¢} \times 8$ **48¢** 6. 0.07×3 **\$0.21** 7. 40×19 **\$760** 8. 40.06×32 **\$1281.92**

- A14 9. 5.7×3 **17.1** 10. 7.9×8 **63.2** 11. 4.6×85 **391** 12. 312×12.5 **3900**

- A15 13. 5.25×6 **31.5** 14. 0.96×7 **6.72** 15. 2.78×93 **258.54** 16. 383×1.95 **746.85**

69

Assigning the Practice

Minimum: 1-8

Average: 1-8

Enriched: 1-8

Review Exercises

Questions	Objective	Pages
1-4	A13	60-61
5-8	M3	62-63
9-12	A14	64-65
13-16	A15	66-67

Reinforcement

Play this equation game.

Materials: numeral cards, 1 to 35

3 dice for each pair of students

Rules: Shuffle the numeral cards and randomly select and display one. The students roll their dice and try to make an equation equal to the number displayed. Any combination of +, -, \times , \div can be used. Equations must be made in twenty seconds.

Scoring: Each pair to construct a correct equation equal to the number displayed scores 1 point. A bonus point is given to the pair who constructs the equation first.

Variation: Have the pairs of students form as many equations as possible in one minute. Points are given according to the number of correct equations made.

Enrichment

Have the students research a mathematician named Leonard Euler. Tell them to find out about his life, his contributions to mathematics today, and why he used mental calculation.

Extra Practice

Worksheet PS3

Pages 68-69

Mentally compute the answers to these problems.

- How old will a 37-year-old person be 15 years from now? **52**
- How much is left from \$10, if you spend \$4 on lunch and lose \$2? **\$4**
- If today is Friday, what day will it be 9 days from now? **Sunday**
- How much does each person get if 4 families of 3 equally share \$36? **\$3**
- What is the perimeter of a rectangular field that is 20 m by 30 m? **100 m**
- How many \$50 bills are needed to pay a \$300 debt? **6**

Problem Solving Activities

Assign Level 6, Unit 3

Unit 3 Objective	Test Questions	Pages
A8	1-4	50-51
A9	5-8	52-53
A10	9-12	54-55
A11	13-16	56-57
A12	17-26	58-59
A13	27-29	60-61
M3	30-33	62-63
A14	34-37	64-65
A15	38-41	66-67

TEST

UNIT 3

Find the product.

1. $142 \times 2 = 284$
5. $23 \times 12 = 276$
9. $204 \times 121 = 24\,684$
13. $172 \times 500 = 86\,000$
17. $5^2 = 25$
21. $5^3 = 125$

2. $638 \times 3 = 1\,914$
6. $65 \times 13 = 845$
10. $703 \times 436 = 306\,508$
14. $963 \times 150 = 144\,450$
18. $10^4 = 10\,000$
22. $10^2 = 100$

3. $509 \times 6 = 3\,054$
7. $66 \times 77 = 5\,082$
11. $995 \times 415 = 412\,925$
15. $486 \times 204 = 99\,144$
19. $2^5 = 32$
23. $3^3 = 27$

4. $4\,123 \times 5 = 20\,615$
8. $135 \times 28 = 3\,780$
12. $897 \times 638 = 572\,286$
16. $713 \times 809 = 576\,817$
20. $7^1 = 7$
24. $4^2 = 16$

Copy and complete.

25. $9\,000 = 9 \times 10^3 = 3$
26. $20\,000 = 2 \times 10^4 = 4$

Estimate the product.

27. $621 \times 39 \approx 24\,000$
28. $79 \times 2.8 \approx 240$
29. $137 \times 5.19 \approx 500$

Multiply.

30. $6¢ \times 9 = 54¢$
34. $4.2 \times 3 = 12.6$
38. $6.75 \times 3 = 20.25$

31. $\$0.08 \times 7 = \0.56
35. $46 \times 2.5 = 115$
39. $93 \times 0.27 = 25.11$

32. $\$3.05 \times 25 = \76.25
36. $62.3 \times 405 = 25\,231.5$
40. $5.08 \times 123 = 624.84$

33. $\$14.95 \times 68 = \$1\,016.60$
37. $737 \times 30.6 = 22\,552.2$
41. $697 \times 8.05 = 5\,610.85$

Post-Test

Unit 3

Find the product.

1. $26 \times 5 = 130$
5. $75 \times 36 = 2\,700$
9. $245 \times 783 = 191\,835$
13. $743 \times 600 = 445\,800$

2. $382 \times 7 = 2\,674$
6. $89 \times 67 = 5\,963$
10. $658 \times 249 = 163\,842$
14. $293 \times 870 = 254\,910$

3. $596 \times 4 = 2\,384$
7. $37 \times 46 = 1\,702$
11. $605 \times 987 = 597\,135$
15. $236 \times 804 = 189\,744$

4. $86 \times 7 = 602$
8. $92 \times 8 = 736$
12. $34 \times 64 = 2\,176$
16. $71 \times 50 = 3\,550$

Calculate.

17. $2^5 = 32$
18. $9^3 = 729$
19. $10^4 = 10\,000$
20. $1^5 = 1$

Find the sum.

- | | | | |
|--|---|--|--|
| 1. $\begin{array}{r} 268 \\ + 21 \\ \hline 289 \end{array}$ | 2. $\begin{array}{r} \$7.25 \\ + 0.38 \\ \hline \$7.63 \end{array}$ | 3. $\begin{array}{r} 648 \\ + 727 \\ \hline 1375 \end{array}$ | 4. $\begin{array}{r} 135 \\ + 679 \\ \hline 814 \end{array}$ |
| 5. $\begin{array}{r} 3124 \\ + 652 \\ \hline 3776 \end{array}$ | 6. $\begin{array}{r} \$25.36 \\ + 55.84 \\ \hline \$81.20 \end{array}$ | 7. $\begin{array}{r} 31\ 252 \\ + 8\ 392 \\ \hline 39\ 644 \end{array}$ | 8. $\begin{array}{r} 79\ 286 \\ + 97\ 695 \\ \hline 176\ 981 \end{array}$ |
| 9. $\begin{array}{r} 215 \\ 69 \\ + 512 \\ \hline 796 \end{array}$ | 10. $\begin{array}{r} \$50.27 \\ 5.36 \\ + 14.98 \\ \hline \$70.61 \end{array}$ | 11. $\begin{array}{r} 61\ 249 \\ 87 \\ + 5\ 765 \\ \hline 67\ 101 \end{array}$ | 12. $\begin{array}{r} \$75.23 \\ 1.12 \\ + 88.39 \\ \hline \$164.74 \end{array}$ |
| 13. $79 + 2 + 34 + 123$
238 | 14. $6.4 + 32 + 1.12 + 5.119$
44.639 | | |

Find the difference.

- | | | | |
|--|--|--|---|
| 15. $\begin{array}{r} 394 \\ - 26 \\ \hline 368 \end{array}$ | 16. $\begin{array}{r} 408 \\ - 129 \\ \hline 279 \end{array}$ | 17. $\begin{array}{r} \$7.13 \\ - 4.50 \\ \hline \$2.63 \end{array}$ | 18. $\begin{array}{r} 4025 \\ - 673 \\ \hline 3352 \end{array}$ |
| 19. $\begin{array}{r} 6352 \\ - 2814 \\ \hline 3538 \end{array}$ | 20. $\begin{array}{r} \$20.00 \\ - 14.95 \\ \hline \$5.05 \end{array}$ | 21. $\begin{array}{r} 30\ 110 \\ - 7\ 862 \\ \hline 22\ 248 \end{array}$ | 22. $\begin{array}{r} 80\ 008 \\ - 39\ 119 \\ \hline 40\ 889 \end{array}$ |

Subtract. Check by adding.

- | | | | |
|---|---|---|---|
| 23. $\begin{array}{r} 2.3 \\ - 1.7 \\ \hline 0.6 \end{array}$ | 24. $\begin{array}{r} 8.3 \\ - 0.15 \\ \hline 8.15 \end{array}$ | 25. $\begin{array}{r} 88.0 \\ - 0.579 \\ \hline 87.421 \end{array}$ | 26. $\begin{array}{r} 3.0 \\ - 0.75 \\ \hline 2.25 \end{array}$ |
|---|---|---|---|

Solve.

27. On a ski trip in the Rocky Mountains, Carl spent \$250 on air fare, \$399 on lodgings and lift tickets, and \$125 on food and other expenses.
- a. How much did he spend in all? $\$774$
- b. How much did he have left from \$800? $\$26$

71

$3^3 = 27$ 22. $7^2 = 49$ 23. $5^3 = 125$ 24. $6^1 = 6$

$4 \times 10^2 = 400$ 26. $4 \times 10^5 = 400\ 000$

imate the product.

$406 \times 68 = 27\ 608$ 28. $32 \times 9.9 = 316.8$ 29. $\$9.85 \times 22 = \216.70

$400 \times 70 = 28\ 000$ $30 \times 10 = 300$ $\$10 \times 20 = \200

ltiply.

- | | | | |
|---|--|---|---|
| $\begin{array}{r} 4\text{¢} \\ \times 8 \\ \hline 32\text{¢} \end{array}$ | 31. $\begin{array}{r} \$0.03 \\ \times 2 \\ \hline \$0.06 \end{array}$ | 32. $\begin{array}{r} \$5.05 \\ \times 63 \\ \hline \$318.15 \end{array}$ | 33. $\begin{array}{r} \$46.98 \\ \times 87 \\ \hline \$4087.26 \end{array}$ |
| $\begin{array}{r} 8.9 \\ \times 3 \\ \hline 26.7 \end{array}$ | 35. $\begin{array}{r} 75 \\ \times 4.6 \\ \hline 345.0 \end{array}$ | 36. $\begin{array}{r} 38.7 \\ \times 905 \\ \hline 35\ 023.5 \end{array}$ | 37. $\begin{array}{r} 898 \\ \times 41.6 \\ \hline 37\ 356.8 \end{array}$ |
| $\begin{array}{r} 2.49 \\ \times 8 \\ \hline 19.92 \end{array}$ | 39. $\begin{array}{r} 92 \\ \times 0.57 \\ \hline 52.44 \end{array}$ | 40. $\begin{array}{r} 8.04 \\ \times 694 \\ \hline 5579.76 \end{array}$ | 41. $\begin{array}{r} 572 \\ \times 6.03 \\ \hline 3449.16 \end{array}$ |

UNIT 4

Division

Theme: Farmer's Market

Lesson		Objective	Pages
Review		Review basic division facts.	73
1	A16	Divide a two-digit dividend by a one-digit divisor with a remainder.	74-75
2	A17	Divide a two- or three-digit dividend by a one-digit divisor.	76-77
3	A18	Divide a three- or four-digit dividend by a one-digit divisor.	78-79
4	A19	Divide a four- or five-digit dividend by a one-digit divisor with a zero in the quotient.	80-81
5	A20	Divide a three- or four-digit dividend by a multiple of ten.	82-83
6	A21	Divide a three-digit dividend by a two-digit divisor with a one-digit quotient.	84-85
7	A22	Divide a three- or four-digit dividend by a two-digit divisor with a two-digit quotient.	86-87
8	A23	Divide a four- or five-digit dividend by a two-digit divisor with a three-digit quotient.	88-89
9	A24	Divide a five-digit dividend by a two-digit divisor with a four-digit quotient.	90-91
10	PS4	Choose the correct operation in solving a word problem.	92-93
Test		Division	94
Review		Multiplication	95

About This Unit

Long division is the mathematical skill that usually takes students the longest to master. The concept of division has been introduced simply in the primary grades; work toward complete mastery will continue into grades seven and eight. Probably division requires so much time and practise to master because the algorithm requires the application of many concepts, operations, and skills. It requires understanding of place value, estimation, the inverse relationship of multiplication and division, basic multiplication, and subtraction and addition facts. The lessons in this unit are carefully arranged in order of difficulty and should be taken in sequence.

The lesson examples and problems in this unit demonstrate the two types of division questions, partition and measurement.

partition

12 items

3 in each group

How many groups?

measurement

12 items

3 groups

How many in each group?

Both questions are solved by the equation:
 $12 \div 3 = 4$.

The division algorithm taught in this unit is best illustrated by measurement division problems. However, both types of problems must be presented. Grade 6 students should realize that the algorithm is a means to an end. The algorithm serves equally well in solving both measurement and partitive problems.

Whenever possible the lesson example should be illustrated with concrete materials, such as powers-of-ten materials, trading chips, and dot paper, so that the students grasp the *meaning* of division.

Students who are having difficulty with basic multiplication and division facts may be helped by using a temporary crutch, such as a table.

It may help some students to learn the algorithm if they recall the acronym EMS (Estimate, Multiply, Subtract) for each cycle. Teach them to check their division results with multiplication.

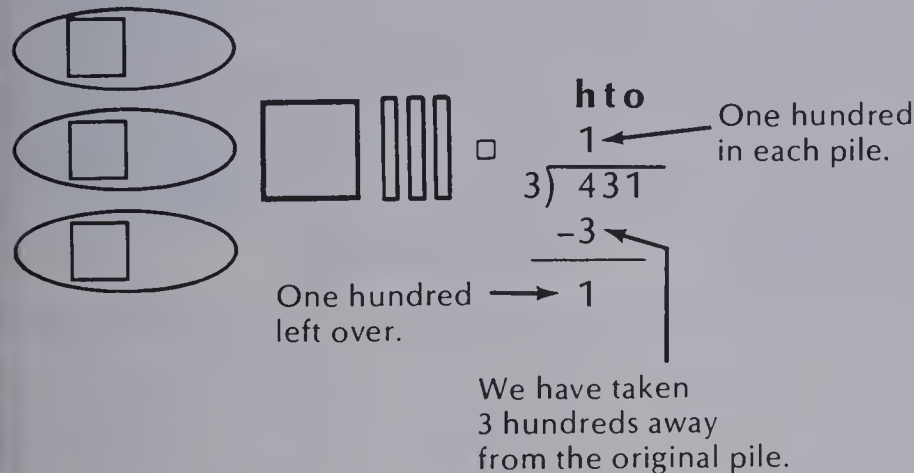
Ideas

Use base-ten blocks to illustrate the division algorithm. The partitive algorithm was chosen because it lends itself to this approach.

For example, divide 431 by 3.

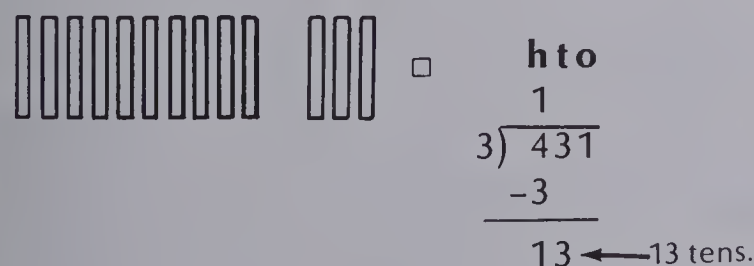


Divide hundreds. Make three piles with a hundred in each pile. There is one hundred left over.



Now trade the left-over hundred for 10 tens.

We have 13 tens.



Divide the tens.

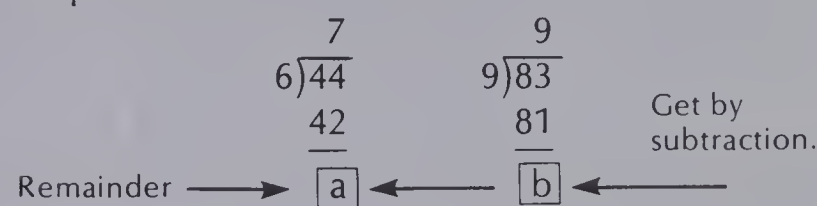
Put the tens in 3 equal piles.

There are 4 tens in each pile with one ten left over.

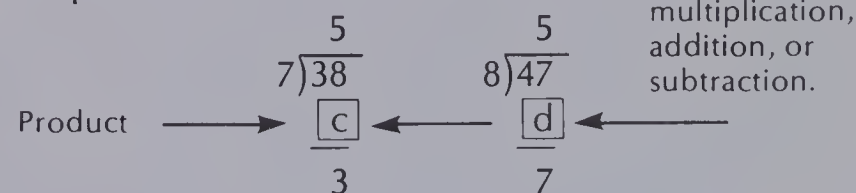
To review the basic structure of the division algorithm you may have the students work through the following sequence.

1. *One Unknown*: Have students work on one unknown at a time.

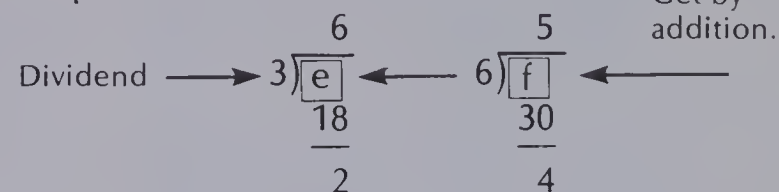
Step 1



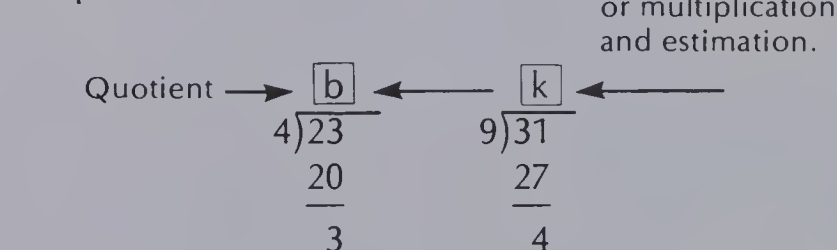
Step 2



Step 3



Step 4



2. *Two Unknowns*; Variations of Two Unknowns

a.

$$\begin{array}{r} 6 \\ 3 \overline{)19} \\ \underline{?} \\ ? \end{array}$$

b.

$$\begin{array}{r} ? \\ 4 \overline{)23} \\ \underline{20} \\ ? \end{array}$$

c.

$$\begin{array}{r} ? \\ 5 \overline{)17} \\ \underline{?} \\ 2 \end{array}$$

d.

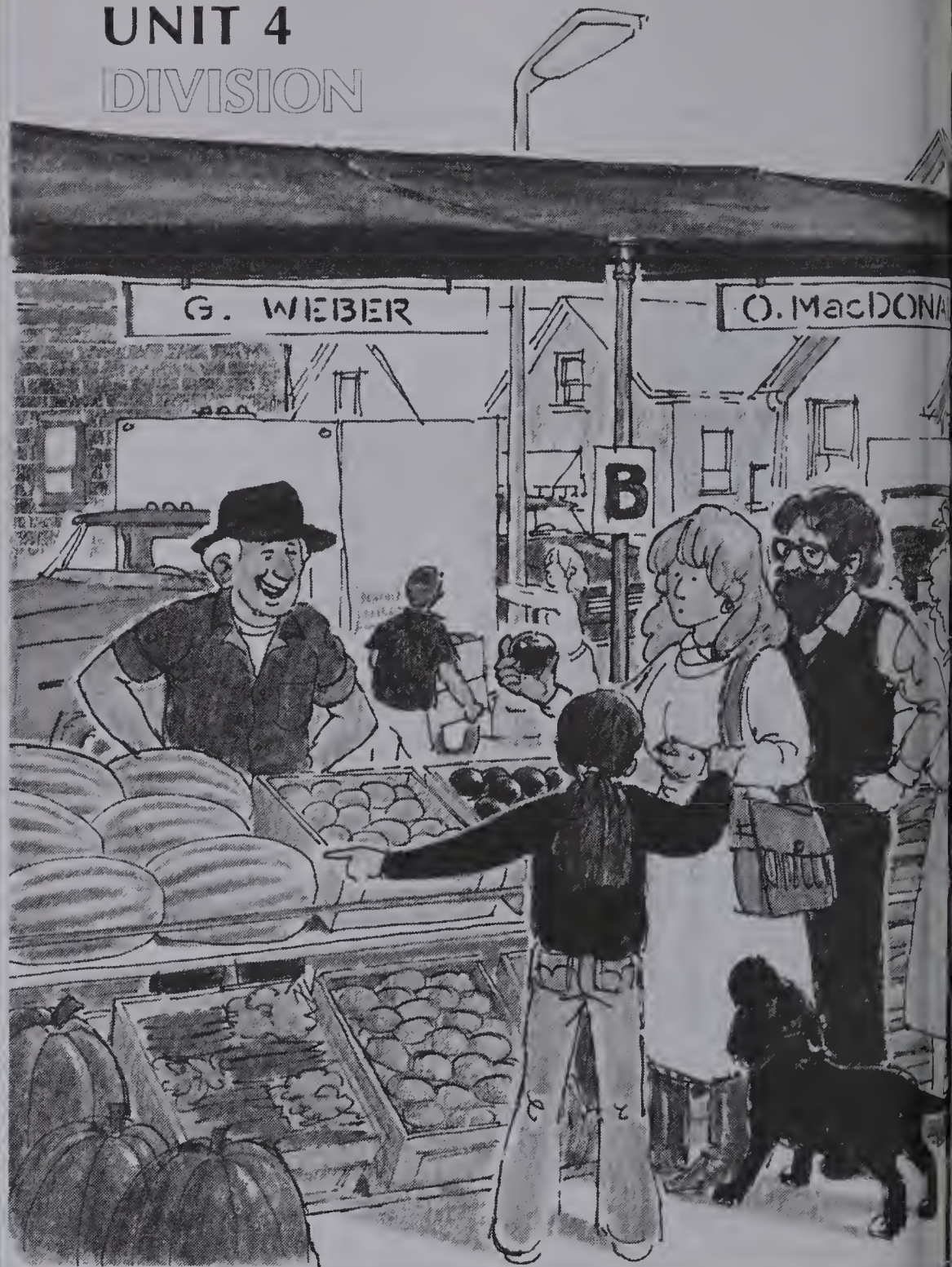
$$\begin{array}{r} ? \\ 6 \overline{) ?} \\ \underline{36} \\ 2 \end{array}$$

3. *Three Unknowns*: The final goal is to have students work with three unknowns.

$$\begin{array}{r} ? \\ 3 \overline{)29} \\ \underline{?} \\ ? \end{array}$$

UNIT 4

DIVISION



Unit 4 Objective	Test Questions	Pages
A16	1-4	74-75
A17	5-8	76-77
A18	9-12	78-79
A19	13-15	80-81
A20	16-18	82-83
A21	19-21	84-85
A22	22-24	86-87
A23	25-27	88-89
A24	28-30	90-91
PS	31-34	

Pretest

Unit 4

Find the quotient.

- $45 \div 7 = \underline{6R3}$
- $51 \div 8 = \underline{6R3}$
- $62 \div 9 = \underline{6R8}$
- $23 \div 3 = \underline{7R2}$
- $42 \div 2 = \underline{21}$
- $67 \div 4 = \underline{16R3}$
- $95 \div 6 = \underline{15R5}$
- $89 \div 7 = \underline{12R5}$
- $263 \div 7 = \underline{37R4}$
- $495 \div 8 = \underline{61R7}$
- $4637 \div 5 = \underline{927R2}$
- $7651 \div 9 = \underline{850R1}$
- $4 \overline{)1796}$
449
- $8 \overline{)3752}$
469
- $7 \overline{)62573}$
8939
- $50 \overline{)375}$
7R25
- $90 \overline{)345}$
3R75
- $80 \overline{)498}$
6R18
- $13 \overline{)146}$
11R3
- $78 \overline{)358}$
4R46
- $41 \overline{)328}$
8
- $22 \overline{)1232}$
56
- $89 \overline{)3457}$
38R75
- $41 \overline{)328}$
8
- $27 \overline{)6841}$
253R10
- $25 \overline{)3875}$
155
- $34 \overline{)1598}$
47
- $78 \overline{)11022}$
141R24

A Market Match

Copy and complete each division equation. Match the answers in the first set with the answers in the second set.

For each kind of vegetable, can you find one pair of answers that does not match?

3, 5, 11, 16

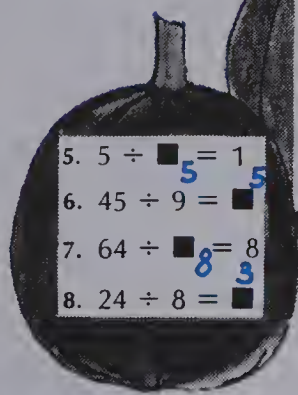


$$49 \div 7 = \blacksquare \quad 7$$

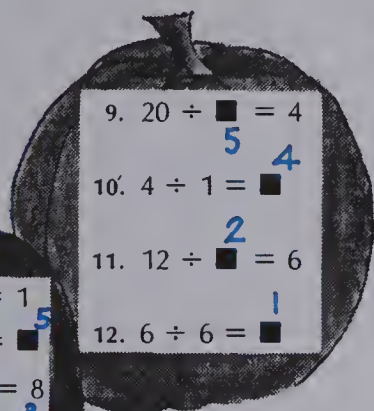
$$8 \div \blacksquare = 8$$

$$36 \div 6 = \blacksquare \quad 6$$

$$21 \div \blacksquare = 7 \quad 3$$



$$\begin{array}{l} 5. 5 \div \blacksquare = 1 \quad 5 \\ 6. 45 \div 9 = \blacksquare \quad 5 \\ 7. 64 \div \blacksquare = 8 \quad 8 \\ 8. 24 \div 8 = \blacksquare \quad 3 \end{array}$$



$$\begin{array}{l} 9. 20 \div \blacksquare = 4 \quad 5 \\ 10. 4 \div 1 = \blacksquare \quad 4 \\ 11. 12 \div \blacksquare = 6 \quad 2 \\ 12. 6 \div 6 = \blacksquare \quad 1 \end{array}$$



$$13. 32 \div 4 = \blacksquare \quad 8$$

$$14. 54 \div \blacksquare = 9 \quad 6$$

$$15. 81 \div 9 = \blacksquare \quad 9$$

$$16. 63 \div \blacksquare = 9 \quad 7$$

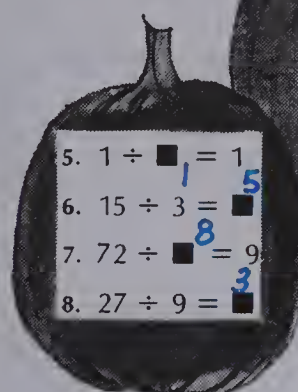


$$56 \div \blacksquare = 8 \quad 7$$

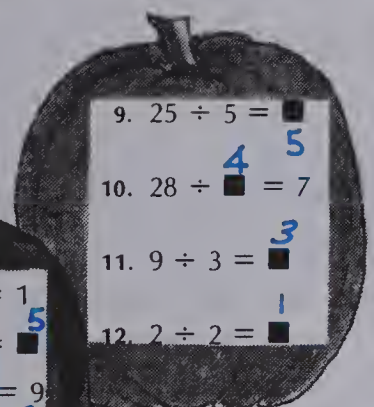
$$9 \div 9 = \blacksquare \quad 1$$

$$56 \div \blacksquare = 7 \quad 8$$

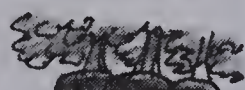
$$12 \div 4 = \blacksquare \quad 3$$



$$\begin{array}{l} 5. 1 \div \blacksquare = 1 \quad 1 \\ 6. 15 \div 3 = \blacksquare \quad 5 \\ 7. 72 \div \blacksquare = 9 \quad 8 \\ 8. 27 \div 9 = \blacksquare \quad 3 \end{array}$$



$$\begin{array}{l} 9. 25 \div 5 = \blacksquare \quad 5 \\ 10. 28 \div \blacksquare = 7 \quad 4 \\ 11. 9 \div 3 = \blacksquare \quad 3 \\ 12. 2 \div 2 = \blacksquare \quad 1 \end{array}$$



$$13. 48 \div \blacksquare = 6 \quad 8$$

$$14. 42 \div 7 = \blacksquare \quad 6$$

$$15. 36 \div \blacksquare = 4 \quad 9$$

$$16. 7 \div 7 = \blacksquare \quad 1$$



73

UNIT 4

PREVIEW

Suggestions

Begin a discussion about farmers' markets like the one pictured on page 72. Talk about the abundance of fruits and vegetables that can be bought directly from the farmer during harvest season. Have the students tell about those fruits and vegetables purchased at an open market which they enjoyed most. Point out that many people who work at such markets are very good at mental arithmetic.

About the Page

All students should be able to write the missing factors in the basic division facts on page 73. An oral flash card drill of basic division facts should precede this exercise. Mastery and quick recall of the facts is essential for all the work in this unit.

Read and discuss the matching of answers required on this page. Note that one pair of answers does not match for each kind of vegetable. Thus, the students can check their own work.

Reinforcement

Write the numerals 1 through 9 on the chalkboard. Ask the students to say as many division names for each as they can. List their suggestions under each numeral.

1	2	3	4	5
$7 \div 7$	$12 \div 6$	$3 \div 1$	$20 \div 5$	$5 \div 1$
$12 \div 12$	$18 \div 9$	$24 \div 8$	$40 \div 10$	$15 \div 3$
etc.	etc.	etc.	etc.	etc.

$$\begin{array}{r} 1210 \\ 31 \overline{)37510} \end{array}$$

$$29. \begin{array}{r} 1000R17 \\ 89 \overline{)89017} \end{array}$$

$$30. \begin{array}{r} 236 \\ 75 \overline{)17700} \end{array}$$

If the dividend is 4788 and the quotient is 84, what is the divisor?

57

If the divisor is 53 and the quotient is 1642, what is the dividend?

87 026

There were 224 guests at a wedding reception seated at 28 tables. How many guests were seated at each table?

8 guests

Mr. Wagner earned \$625.00 per week for 14 weeks. He earned \$700 for the next 12 weeks. How much did he earn in all?

\$17 150

UNIT 4 LESSON 1

Objective A16

Divide a two-digit dividend by a one-digit divisor with a remainder.

Introducing the Lesson

Show the class 60 pencils. Place them on a table and ask the students to put them into groups of 7 held with rubber bands. How many groups of 7 can be made? Are any pencils left over?

Teaching the Lesson

Point out the problem at the top of page 74. Explain that the bundling of pencils is similar to the bundling of corn in the example. Discuss the long-division steps that produce the same result as the bundling of pencils.

1. Estimate.

$$\begin{array}{r|l} 10\text{s} & 1\text{s} \\ 7 & 60 \\ \hline & 8 \end{array}$$

Note that the 8 is placed in the ones place, since there are 8 (and not 80) groups of 7 in 60.

2. Multiply. $8 \times 7 = 56$

$$\begin{array}{r|l} 10\text{s} & 1\text{s} \\ 7 & 60 \\ \hline & 8 \\ & 56 \\ \hline & 4 \end{array}$$

3. Subtract.

$$\begin{array}{r|l} 10\text{s} & 1\text{s} \\ 7 & 60 \\ \hline & 8 \\ & 56 \\ \hline & 4 \end{array}$$

4. Compare.

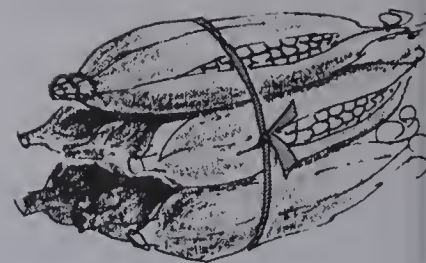
The remainder, 4, is less than the divisor, 7.

Discuss the way this answer can be checked.

8 groups of 7 plus 4 = 60
or, $8 \times 7 + 4 = 60$
or, **quotient \times divisor + remainder = dividend**

Two-Digit Dividends

Natalie collected 60 ears of Indian corn on her farm to sell at the Saturday farmers' market. She tied the ears in bundles of 7 ears each. How many bundles did she have?



$$60 \div 7 = \blacksquare$$

Estimate.

$$\begin{array}{r} 8 \\ 7 \overline{)60} \end{array}$$

Multiply and subtract.

$$\begin{array}{r} 8 \\ 7 \overline{)60} \\ -56 \\ \hline 4 \end{array}$$

Write the remainder.

$$\begin{array}{r} 8R4 \\ 7 \overline{)60} \\ -56 \\ \hline 4 \end{array}$$

Natalie had 8 bundles of 7 ears each. 4 ears were left over.

Check: Quotient \times divisor.

$$8 \times 7 = 56$$

Add remainder

$$56 + 4 = 60$$

Dividend

$$60$$

EXERCISES

Find the quotient. Check your answer.

1. $5 \overline{)14}$ $2R4$
2. $4 \overline{)23}$ $5R3$
3. $7 \overline{)46}$ $6R4$
4. $9 \overline{)65}$ $7R2$
5. $8 \overline{)47}$ $5R7$
6. $6 \overline{)27}$ $4R3$
7. $3 \overline{)15}$ 5
8. $8 \overline{)60}$ $7R4$
9. $3 \overline{)23}$ $7R2$
10. $9 \overline{)75}$ $8R3$
11. $11 \div 2$ $5R1$
12. $19 \div 5$ $3R4$
13. $64 \div 8$ 8
14. $39 \div 7$ $5R4$
15. $33 \div 4$ $8R1$
16. $65 \div 7$ $9R2$
17. $80 \div 9$ $8R8$
18. $27 \div 6$ $4R3$
19. $40 \div 5$ 8
20. $52 \div 8$ $6R4$
21. $47 \div 5$ $9R2$
22. $70 \div 8$ $8R6$
23. $31 \div 6$ $5R1$
24. $19 \div 3$ $6R1$
25. $56 \div 6$ $9R2$

Copy and complete the tables.

26.	\div	6	8	7
	42	7	5R2	6
	27	4R3	3R3	3R6

27.	\div	9	7	8
	56	6R2	8	7
	49	5R4	7	6R1

74

Using the Exercises

- Questions 1 to 25 require the student to find quotients from vertical and horizontal division forms. Check that the students change the horizontal form to vertical form properly as they write their work on paper. See also that they place the one-digit quotient over the ones place in the dividend.

$$\begin{array}{r} 2 \\ 5 \overline{)14} \end{array}$$

- Questions 26 and 27 require that division tables be completed. Do one of them as a class with discussion.

PRACTICE

Find the quotient. Check your answer.

1. $4 \overline{)35}$ **8R3**
2. $5 \overline{)49}$ **9R4**
3. $6 \overline{)54}$ **9**
4. $7 \overline{)64}$ **9R1**
5. $7 \overline{)33}$ **4R5**
6. $7 \overline{)51}$ **7R2**
7. $6 \overline{)30}$ **5**
8. $5 \overline{)29}$ **5R4**
9. $4 \overline{)23}$ **5R3**
10. $8 \overline{)77}$ **9R5**
11. $6 \overline{)50}$ **8R2**
12. $8 \overline{)70}$ **8R6**
13. $4 \overline{)36}$ **9**
14. $2 \overline{)17}$ **8R1**
15. $7 \overline{)60}$ **8R4**
16. $9 \overline{)86}$ **9R5**
17. $7 \overline{)50}$ **7R1**
18. $5 \overline{)49}$ **9R4**
19. $4 \overline{)33}$ **8R1**
20. $8 \overline{)55}$ **6R7**
21. $42 \div 9$ **4R6**
22. $23 \div 3$ **7R2**
23. $47 \div 5$ **9R2**
24. $19 \div 4$ **4R3**
25. $67 \div 7$ **9R4**

For each checking statement, write a corresponding division.

26. $2 \times 3 + 2 = 8$ **$8 \div 3 = 2R2$**
27. $7 \times 5 + 4 = 39$ **$39 \div 5 = 7R4$**
28. $8 \times 7 + 3 = 59$ **$59 \div 7 = 8R3$**
29. $8 \times 8 + 0 = 64$ **$64 \div 8 = 8$**
30. $9 \times 8 + 7 = 79$ **$79 \div 8 = 9R7$**
31. $6 \times 9 + 8 = 62$ **$62 \div 9 = 6R8$**

Copy and complete the tables.

32.

\div	9	6	7
31	3R4	5R1	4R3
45	5	7R3	6R3

33.

\div	5	8	7
24	4R4	3	3R3
36	7R1	4R4	5R1

Solve.

34. What is the cost of one homemade cookie if 5 sell for 40¢? **8¢**
35. What is the cost of one fresh daisy if 8 sell for 80¢? **10¢**

Letter Logic

Each letter stands for a different digit.

Rewrite each letter as a numeral.

$$\begin{array}{r} G \\ B \overline{)AZ} \end{array}$$

$$\begin{array}{r} G \\ C \overline{)AC} \end{array}$$

$$\begin{array}{r} AA \text{ remainder } A \\ B \overline{)BC} \end{array}$$

$$A + A = B \quad B + A = C \quad A - A = Z \quad \begin{array}{r} A \\ A \overline{)A} \end{array} \quad A \times A = A$$

$$A = 1 \quad B = 2 \quad C = 3 \quad G = 5 \quad Z = 0$$

75

Assigning the Practice

Minimum: even numbers

Average: 1-32, 34-35

Enriched: 11-35

Reinforcement

Complete the division.

1. $5 \overline{)29}$
-25
■
2. $7 \overline{)46}$
-42
■
3. $9 \overline{)53}$
-45
■
4. $6 \overline{)38}$
-■
2
5. $8 \overline{)54}$
-■
6
6. $7 \overline{)19}$
-■
5
7. $8 \overline{)72}$
-■
0
8. $9 \overline{)49}$
-45
4
9. $7 \overline{)62}$
-56
6
10. $4 \overline{)29}$
-28
■
11. $5 \overline{)36}$
-■
1
12. $6 \overline{)52}$
-48
■
13. $7 \overline{)72}$
-■
■
14. $8 \overline{)51}$
-■
3
15. $9 \overline{)89}$
-81
■

Enrichment

1. Assign Letter Logic at the bottom of page 75. After the solutions have been found, have the students tell about their method. Use of the properties of one should come out in this discussion. Students should first discover that $A = 1$. Then all the other letters follow easily.

2. For every pair of multiplication facts there are two pairs of related division facts, e.g.,

$$6 \times 7 = 42 \quad \begin{cases} 42 \div 7 = 6 \\ 42 \div 6 = 7 \end{cases}$$

Have the students write the two related division facts for each multiplication fact.

1. $6 \times 3 = 18$
2. $7 \times 4 = 28$
3. $8 \times 6 = 48$
4. $12 \times 8 = 96$
5. $8 \times 9 = 72$
6. $8 \times 7 = 56$
7. $9 \times 12 = 108$
8. $\square \times \triangle = \square$
9. $a \times b = c$

Extra Practice

Find the quotient. Check your answer.

1. $9 \overline{)89}$ **9R8**
2. $4 \overline{)30}$ **7R2**
3. $2 \overline{)19}$ **9R1**
4. $7 \overline{)53}$ **7R4**
5. $8 \overline{)59}$ **7R3**
6. $6 \overline{)39}$ **6R3**
7. $3 \overline{)26}$ **8R2**
8. $5 \overline{)44}$ **8R4**
9. $9 \overline{)70}$ **7R7**
10. $7 \overline{)61}$ **8R5**
11. $4 \overline{)39}$ **9R3**
12. $8 \overline{)64}$ **8**

Solve.

If 49 tires are stacked in 7 equal piles, how many tires are in each pile?

7 tires

Can 8 children share 35 brownies equally?

No. 4R3

Worksheet A16

Pages 74-75

UNIT 4 LESSON 2

Objective A17

Divide a two- or a three-digit dividend by a one-digit divisor.

Introducing the Lesson

Provide a quick flash card drill of basic division facts. After the drill, have the students mentally calculate quotients and remainders for these and similar divisions.

$$16 \div 5, 26 \div 8, 31 \div 6, 45 \div 8$$

Teaching the Lesson

Read and discuss the problem at the top of page 76. Model the division $175 \div 2$ with place-value number blocks.

1. Divide the tens.

$$17 \text{ tens} \div 2 = 8 \text{ tens}, 1 \text{ left over}$$

$$\begin{array}{r} 8 \\ 2 \overline{) 17} \\ \underline{-16} \\ 1 \end{array}$$

Change the left over ten to 10 ones.

2. Divide the ones.

$$15 \text{ ones} \div 2 = 7 \text{ ones}, 1 \text{ left over}$$

$$\begin{array}{r} 87 \\ 2 \overline{) 175} \\ \underline{-16} \\ 15 \\ \underline{-14} \\ 1 \end{array}$$

Explain the short-division steps, also.

$$\begin{array}{r|l} 10\text{s} & 1\text{s} \\ 8 & 7 \text{ R}1 \\ \hline 2 \overline{) 17} & 5 \end{array}$$

Divide the tens:

Estimate. *Mentally* multiply and subtract.

1 is left over.

Divide the ones:

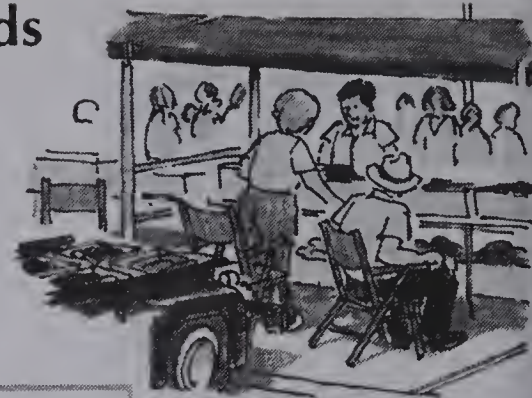
Estimate. *Mentally* multiply and subtract.

1 is left over.

Have the students model with number blocks and then work either the long- or short-division algorithm for several other similar examples. Point out, too, how each answer is checked: quotient \times divisor + remainder = dividend.

Three-Digit Dividends

The manager of a farmers' market has 2 folding chairs for each farmer to use at the booths. If the manager had 175 chairs in all, how many farmers could get 2 chairs?



$$175 \div 2 = \blacksquare$$

Long Division

Divide the tens

Divide the ones.

$$\begin{array}{r} 87\text{R}1 \\ 2 \overline{) 175} \\ \underline{-16} \\ 15 \\ \underline{-14} \\ 1 \end{array}$$

Short Division

Divide the tens.

Divide the ones. Write the remainder.

$$\begin{array}{r} 87\text{R}1 \\ 2 \overline{) 175} \end{array}$$

Check:

$$\begin{array}{r} 87 \text{ quotient} \\ \times 2 \text{ divisor} \\ \hline 174 \\ + 1 \text{ remainder} \\ \hline 175 \text{ dividend} \end{array}$$

87 farmers could get 2 chairs each. One chair is left over.

EXERCISES

Find the quotient. Check your answer.

1. $3 \overline{) 47}$ *15R2*
2. $2 \overline{) 29}$ *14R1*
3. $5 \overline{) 64}$ *12R4*
4. $7 \overline{) 92}$ *13R1*
5. $4 \overline{) 57}$ *14R1*
6. $6 \overline{) 71}$ *11R5*
7. $8 \overline{) 89}$ *11R1*
8. $2 \overline{) 77}$ *38R1*
9. $5 \overline{) 86}$ *17R1*
10. $3 \overline{) 44}$ *14R2*
11. $85 \div 3$ *28R1*
12. $69 \div 5$ *13R4*
13. $35 \div 2$ *17R1*
14. $57 \div 3$ *19*
15. $71 \div 4$ *17R3*
16. $124 \div 7$ *17R5*
17. $409 \div 6$ *68R1*
18. $376 \div 5$ *75R1*
19. $214 \div 9$ *23R7*
20. $500 \div 8$ *62R4*
21. $457 \div 8$ *57R1*
22. $532 \div 7$ *76*
23. $495 \div 6$ *82R3*
24. $713 \div 8$ *89R1*
25. $702 \div 9$ *78*

Divide each number by 5.

26. $63 \overline{) 315}$ *51*
27. $55 \overline{) 275}$ *5*
28. $87 \overline{) 435}$ *5*
29. $19 \overline{) 95}$ *5*
30. $44 \overline{) 220}$ *5*

Using the Exercises

- Questions 1 to 15 involve two-digit dividends with two-digit quotients. Some of the questions are written in horizontal format and the student must write them in vertical format.
- Questions 16 to 25 involve three-digit dividends with two-digit quotients.
- Questions 26 to 30 require that the students themselves set up the division question.
- Students having difficulty with the alignment of hundreds, tens, and ones should do their work on graph paper.

PRACTICE

Find the quotient. Check your answer.

1. $2 \overline{)28}$ 14
2. $3 \overline{)68}$ $22R2$
3. $4 \overline{)95}$ $23R3$
4. $5 \overline{)90}$ 18
5. $6 \overline{)87}$ $14R3$
6. $6 \overline{)96}$ 16
7. $8 \overline{)91}$ $11R3$
8. $7 \overline{)80}$ $11R3$
9. $5 \overline{)73}$ $14R3$
10. $4 \overline{)59}$ $14R3$
11. $291 \div 3$ 97
12. $173 \div 2$ $86R1$
13. $355 \div 4$ $88R3$
14. $564 \div 6$ 94
15. $397 \div 5$ $79R2$
16. $517 \div 6$ $86R1$
17. $498 \div 5$ $99R3$
18. $300 \div 4$ 75
19. $408 \div 9$ $45R3$
20. $777 \div 8$ $97R1$

Copy and complete. Use < or >.

21. $27 \div 5$ \bullet $58 \div 7$ $<$
22. $78 \div 9$ \bullet $62 \div 7$ $<$
23. $57 \div 4$ \bullet $83 \div 6$ $>$
24. $287 \div 8$ \bullet $191 \div 8$ $>$
25. $200 \div 9$ \bullet $134 \div 6$ $<$
26. $235 \div 9$ \bullet $80 \div 3$ $<$

Solve.

27. Two boys at the market made \$38 in tips helping people load heavy boxes into their cars. How much money did each boy make? $\$19$
28. If 3 stalks of celery sell for 99¢, what does 1 stalk cost? $33¢$

Consumer Question

Which is the better buy?

- a. one bar of soap for 49¢ or three bars of soap for \$1.29



$3 \text{ for } \$1.29$



- b. one tube of toothpaste for \$1.19 or two tubes of toothpaste for \$2.29

$\text{two for } \$2.29$

- c. three boxes of tissues for \$1.39 or five boxes of tissues for \$2.44



$3 \text{ for } \$1.39$



77

Assigning the Practice

Minimum: 1-20

Average: 1-22, 27-28

Enriched: 11-28

Reinforcement

Complete each set of division problems. Look for a pattern and explain it in words.

1. $2 \overline{)2}$ $2 \overline{)20}$ $2 \overline{)200}$
2. $2 \overline{)4}$ $2 \overline{)40}$ $2 \overline{)400}$
3. $2 \overline{)6}$ $2 \overline{)60}$ $2 \overline{)600}$
3. $3 \overline{)3}$ $3 \overline{)30}$ $3 \overline{)300}$
4. $3 \overline{)6}$ $3 \overline{)60}$ $3 \overline{)600}$
5. $3 \overline{)9}$ $3 \overline{)90}$ $3 \overline{)900}$
6. $4 \overline{)4}$ $4 \overline{)40}$ $4 \overline{)400}$
7. $2 \overline{)22}$ $2 \overline{)44}$ $2 \overline{)220}$
 $2 \overline{)440}$ $2 \overline{)66}$ $2 \overline{)660}$
 $2 \overline{)88}$ $2 \overline{)880}$ $2 \overline{)100}$
8. $3 \overline{)33}$ $3 \overline{)330}$ $3 \overline{)66}$
 $3 \overline{)660}$ $3 \overline{)99}$ $3 \overline{)990}$
 $3 \overline{)999}$
9. $4 \overline{)12}$ $4 \overline{)120}$ $6 \overline{)12}$
 $6 \overline{)120}$ $3 \overline{)12}$ $3 \overline{)120}$

Enrichment

1. Assign *Consumer Question* at the bottom of page 77. Part c is a two-step problem. Students can find the cost of one of each and then compare. All questions can also be done by multiplication. For part a, find the cost of three; for part b, find the cost of two; for part c, find the cost of 15 boxes.

2. a. Use 5 as the divisor and make up four division problems each having a remainder of 1. e.g. $16 \div 5 = 3, R = 1$,

b. Use 5 as the divisor and make up four division problems each having a remainder of 2, (3, 4).

c. Use 6 as the divisor and make up four division problems each having a remainder of 1, (2, 3, 4, 5).

d. Use 7 (8, 9) as the divisor and make up four division problems each having a remainder of 1 (2, 3, 4, 5, 6).

Extra Practice

Find the quotient. Check your answer.

1. $2 \overline{)37}$ $18R1$
2. $4 \overline{)57}$ $14R1$
3. $6 \overline{)95}$ $15R5$
4. $5 \overline{)84}$ $16R4$
5. $9 \overline{)98}$ $10R8$
6. $5 \overline{)67}$ $13R2$
7. $4 \overline{)68}$ 17
8. $7 \overline{)88}$ $12R4$
9. $3 \overline{)73}$ $24R1$
10. $7 \overline{)99}$ $14R1$
11. $4 \overline{)76}$ 19
12. $3 \overline{)87}$ 29

Solve

How many equal packages of 4 will 96 bars of soap make?

24 packages

Can \$51.00 be equally shared by 3 people?

$\text{Yes, } \$17 \text{ each}$

Worksheet A17

Pages 76-77

UNIT 4 LESSON 3

Objective A18

Divide a three- or four-digit dividend by a one-digit divisor.

Introducing the Lesson

Model the number 2446 with place-value number blocks and ask a student to separate them in two groups.

How much is in each group? 1223.

Explain that this separating of the number blocks models the division $2446 \div 2 = 1223$. Show how first the thousands, then the hundreds, tens, and ones are divided.

$$\frac{1}{2} \rightarrow \frac{12}{24} \rightarrow \frac{122}{244} \rightarrow \frac{1223}{2446}$$

Teaching the Lesson

Read and discuss the problem at the top of page 78. Explain that here, too, we must divide by 2 in order to find half of something. Model the division with number blocks.



Demonstrate the division by regrouping one of the thousands blocks into 10 hundreds. Divide. Then regroup a hundreds block into 10 tens. Finally, regroup a ten into 10 ones and divide.

Explain the division by the long- and short-division methods. The estimate, multiply, subtract, and compare steps are repeated four times. Point out, too, the check:

$$\text{quotient} \times \text{divisor} = \text{dividend}$$

or

$$1575 \times 2 = 3150$$

Have the students model and record several other divisions by 2. See if anyone notices that a quotient will have no remainder when the dividend is an even number. Gradually have the students divide by other one-digit divisors. Talk about the occasions when the quotient has no remainder. Students should use the long- and short-division methods. Provide graph paper for students who have difficulty with number alignment.

Four-Digit Dividends

A farmer sold \$3150 worth of fresh dairy products and smoked meats in September at the Saturday markets. In October, he sold half as much. How much did he sell in October?

$$\$3150 \div 2 = \blacksquare$$



Long Division

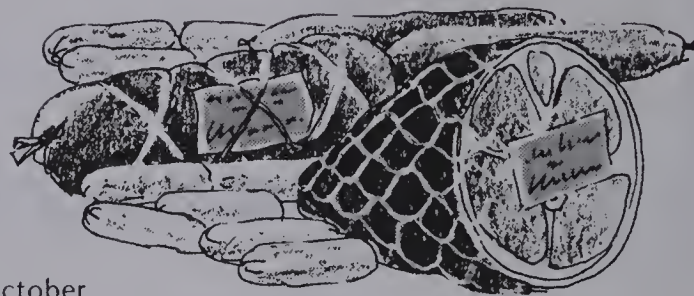
$$\begin{array}{r} 1575 \\ 2 \overline{) 3150} \\ \underline{-2} \\ 11 \\ \underline{-10} \\ 15 \\ \underline{-14} \\ 10 \\ \underline{-10} \\ 0 \end{array}$$

Short Division

$$\begin{array}{r} 1575 \\ 2 \overline{) 3150} \end{array}$$

Check:

$$\begin{array}{r} 1575 \text{ quotient} \\ \times 2 \text{ divisor} \\ \hline 3150 \text{ dividend} \end{array}$$



He sold \$1575 worth in October.

EXERCISES

Find the quotient. Check your answer.

- | | | | |
|--|---------------------------------------|--|--|
| 1. $2 \overline{) 317}$ 158 R1 | 2. $4 \overline{) 756}$ 189 | 3. $5 \overline{) 730}$ 146 | 4. $3 \overline{) 675}$ 225 |
| 5. $6 \overline{) 829}$ 138 R1 | 6. $7 \overline{) 945}$ 135 | 7. $8 \overline{) 917}$ 114 R5 | 8. $5 \overline{) 984}$ 196 R4 |
| 9. $7 \overline{) 1592}$ 227 R3 | 10. $6 \overline{) 4182}$ 697 | 11. $5 \overline{) 1815}$ 363 | 12. $9 \overline{) 7538}$ 837 R5 |
| 13. $2 \overline{) 5162}$ 2581 | 14. $3 \overline{) 4791}$ 1597 | 15. $5 \overline{) 6469}$ 1293 R4 | 16. $4 \overline{) 7517}$ 1879 R1 |
| 17. $6873 \div 3$ 2291 | 18. $9786 \div 6$ 1631 | 19. $7597 \div 4$ 1899 R1 | 20. $8995 \div 7$ 1285 |

Using the Exercises

- Questions 1 to 8 involve three-digit dividends and quotients.
 - Questions 9 to 12 have four-digit dividends and three-digit quotients. Check that the students line up the hundreds, tens, and ones properly.
- | 100s | 10s | 1s | |
|------|-----|----|----|
| 2 | 2 | 7 | R3 |
| 7 | 15 | 9 | 2 |
- Questions 13 to 20 involve four-digit dividends and quotients.
 - For all of the divisions, students must check their answers. They can choose either the long- or short-division method. Students having difficulty with number alignment should do their work on graph paper.

PRACTICE

Find the quotient.

1. $3 \overline{)509}$ $169 R2$
2. $4 \overline{)948}$ 237
3. $5 \overline{)868}$ $173 R3$
4. $4 \overline{)885}$ $221 R1$
5. $4 \overline{)575}$ $143 R3$
6. $5 \overline{)603}$ $120 R3$
7. $6 \overline{)792}$ 132
8. $7 \overline{)806}$ $115 R1$
9. $9 \overline{)1647}$ 183
10. $7 \overline{)1092}$ 156
11. $8 \overline{)1080}$ 135
12. $5 \overline{)1245}$ 249
13. $6 \overline{)2740}$ $456 R4$
14. $8 \overline{)4482}$ $560 R2$
15. $4 \overline{)2351}$ $587 R3$
16. $9 \overline{)4693}$ $521 R4$
17. $1983 \div 2$ $991 R1$
18. $2795 \div 8$ $349 R3$
19. $3455 \div 7$ $493 R4$
20. $2195 \div 5$ 439
21. $4693 \div 4$ $1173 R1$
22. $5830 \div 3$ $1943 R1$
23. $8976 \div 6$ 1496
24. $9590 \div 8$ $1198 R6$

Divide each number by 9.

25. $6219 \div 9$ 691
26. $7362 \div 9$ 818
27. $5499 \div 9$ 611
28. $8073 \div 9$ 897

Copy and complete the tables.

29.

\div	5	4
6230	1246	1557 R2
7955	1591	1988 R3
4090	818	1022 R2

30.

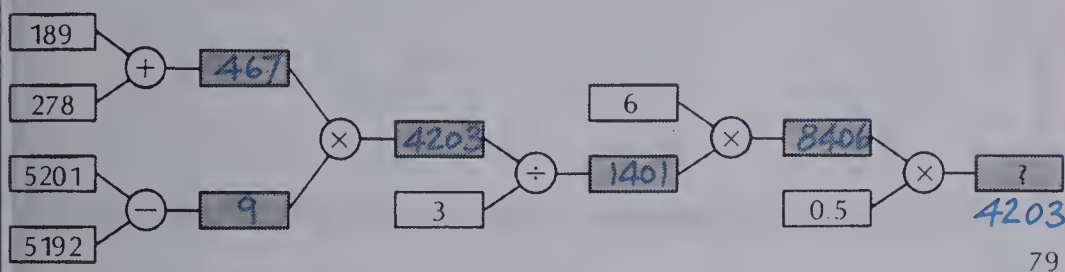
\div	3	7
6147	2049	878 R1
2865	955	409 R2
9294	3098	1327 R5

Solve.

31. Four families sold their unwanted furniture and appliances at a flea market for \$476. How much would each family receive if they were to share the money equally? $\$119$

Math Hopscotch

Complete all the steps.



Assigning the Practice

Minimum: 1-24

Average: 1-28, 31

Enriched: 9-31

Reinforcement

1. Assign *Math Hopscotch* at the bottom of page 79. This exercise provides a review of the four basic operations. Students can check their work with a calculator.

2. Complete the division and fill in the missing digits.

$$\begin{array}{r} 1 \blacksquare \\ 5 \overline{)9 \blacksquare} \\ -5 \\ \hline \blacksquare 6 \\ -4 \\ \hline \blacksquare \end{array}$$

$$\begin{array}{r} \blacksquare \blacksquare \\ 2 \overline{)\blacksquare \blacksquare} \\ -4 \\ \hline 1 3 \\ -\blacksquare \blacksquare \\ \hline \blacksquare \end{array}$$

$$\begin{array}{r} \blacksquare \blacksquare \blacksquare \blacksquare \\ 8 \overline{)\blacksquare \blacksquare \blacksquare \blacksquare} \\ -4 0 \\ \hline 6 5 \\ -\blacksquare \blacksquare \\ \hline 1 \\ -16 \\ \hline 1 \end{array}$$

Enrichment

1. Prepare work cards that ask that a half, a third, a fourth, or a fifth of a number of up to four-digits be found. The lesson example found a half by dividing by 2. Students should be able to conclude that finding a third is the same as dividing by 3, that finding a fourth is the same as dividing by 4, and so on.

What is one-fourth of 5932?

What is one-fifth of \$7650?

2. Find four 3-digit numbers that result in a remainder of zero when divided by 5. e.g.

$$\begin{array}{r} 53 \\ 5 \overline{)265} \end{array}$$

3. Find four 3-digit numbers that result in a remainder of 1 when divided by 5.

4. Find four 3-digit numbers that result in remainders of 2, 3, and 4 when divided by 5.

5. Find four 4-digit numbers that result in remainders of 1, 2, 3, and 4 when divided by 5.

6. Find four 4-digit numbers that result in remainders of 0, 1, 2, 3, 4, 5, and 6 when divided by 7.

Extra Practice

Find the quotient. Check your answer.

1. $6 \overline{)517}$ $86 R1$
2. $3 \overline{)296}$ $98 R2$
3. $8 \overline{)432}$ 54
4. $7 \overline{)627}$ $89 R4$
5. $9 \overline{)873}$ 97
6. $6 \overline{)524}$ $87 R2$
7. $5 \overline{)372}$ $74 R2$
8. $7 \overline{)401}$ $57 R2$
9. $9 \overline{)600}$ $66 R6$
10. $3 \overline{)117}$ 39
11. $8 \overline{)750}$ $93 R6$
12. $4 \overline{)391}$ $97 R3$

Solve

If 348 is the dividend and 3 is the divisor, what is the quotient?

116

If 48 is the quotient and 3 is the divisor, what is the dividend?

144

Worksheet A18

Pages 78-79

UNIT 4 LESSON 4

Objective A19

Divide a four- or five-digit dividend by a one-digit divisor with a zero in the quotient.

Introducing the Lesson

Help the students recall the importance of zero as a place holder. Write several addition, subtraction, and multiplication examples on the chalkboard with zeros in their answers.

100s	10s	1s
6	3	5
+1	6	5
8	0	0

or 8 hundreds + 0 tens + 0 ones

The two zeros have no numerical value, yet they have the important role of “**holding** the tens and the ones in place.” Without them, the sum would appear incorrect: 8.

Explain that division also needs zero as a place holder.

Teaching the Lesson

Point out the problem at the top of page 80. Write the division needed for its solution on the chalkboard and explain each step involved. Stress especially the step requiring a zero in the quotient.

1000s	100s	10s	1s
2	0	4	3
3) 6	1	2	9
-6			
0	1		
	-0		
	1	2	
	-1	2	
		0	9
			-9
			0

1. Divide the thousands.
 $6 \div 3 = 2$
2. Divide the hundreds.
 $1 \div 3 = 0 \text{ R}1$
3. Divide the tens.
 $12 \div 3 = 4$
4. Divide the ones.
 $9 \div 3 = 3$

Zero in the Quotient



Mrs. Spencer sold fresh vegetables all summer at the weekend market and made \$6129. How much did she make if she has to share it equally with her two assistants?

$$\$6129 \div 3 = \blacksquare$$

Long Division

Estimate, multiply, and subtract.

$$\begin{array}{r} 2 \\ 3 \overline{) 6129} \\ \underline{-6} \\ 01 \end{array}$$

Can't divide.

Write zero and try the next place.

$$\begin{array}{r} 20 \\ 3 \overline{) 6129} \\ \underline{-6} \\ 012 \end{array}$$

Estimate, multiply, and subtract.

$$\begin{array}{r} 204 \\ 3 \overline{) 6129} \\ \underline{-6} \\ 012 \\ \underline{-12} \\ 09 \end{array}$$

$$\begin{array}{r} 2043 \\ 3 \overline{) 6129} \\ \underline{-6} \\ 012 \\ \underline{-12} \\ 09 \\ \underline{-9} \\ 0 \end{array}$$

Short Division

$$\begin{array}{r} 2043 \\ 3 \overline{) 6129} \end{array}$$

She made \$2043.

Check:

$$\begin{array}{r} 2043 \text{ quotient} \\ \times 3 \text{ divisor} \\ \hline 6129 \text{ dividend} \end{array}$$

EXERCISES

Find the quotient. Check your answer.

1. $2 \overline{) 614}$ 307
2. $5 \overline{) 508}$ $101 \text{ R}3$
3. $7 \overline{) 751}$ $107 \text{ R}2$
4. $4 \overline{) 805}$ $201 \text{ R}1$
5. $7 \overline{) 1435}$ 205
6. $2 \overline{) 2802}$ 1401
7. $9 \overline{) 8116}$ $901 \text{ R}7$
8. $8 \overline{) 5614}$ $701 \text{ R}6$
9. $3 \overline{) 9275}$ $3091 \text{ R}2$
10. $6 \overline{) 6465}$ $1077 \text{ R}3$
11. $5 \overline{) 5298}$ $1059 \text{ R}3$
12. $4 \overline{) 8136}$ 2034
13. $3 \overline{) 27183}$ 9061
14. $7 \overline{) 49648}$ $7092 \text{ R}4$
15. $8 \overline{) 23175}$ $2896 \text{ R}7$
16. $4 \overline{) 12392}$ 3098
17. $4 \overline{) 8009}$ $2002 \text{ R}1$
18. $3 \overline{) 9018}$ 3006
19. $6 \overline{) 6058}$ $1009 \text{ R}4$
20. $8 \overline{) 8073}$ $1009 \text{ R}1$

Using the Exercises

- Questions 1 to 20 involve three- and four-digit quotients having zeros. Work several of these examples with discussion. All quotients must be checked. Students may work on graph paper to help eliminate number alignment difficulties.

PRACTICE

Find the quotient.

1. $2 \overline{)4165}$ **2082 R1**
2. $3 \overline{)6924}$ **2308**
3. $4 \overline{)7803}$ **1950 R3**
4. $5 \overline{)9005}$ **1801**
5. $8 \overline{)8073}$ **1009 R1**
6. $6 \overline{)6547}$ **1090 R7**
7. $9 \overline{)3152}$ **350 R2**
8. $7 \overline{)2801}$ **400 R1**
9. $2 \overline{)12001}$ **6000 R1**
10. $7 \overline{)49004}$ **7000 R4**
11. $3 \overline{)27011}$ **9003 R2**
12. $6 \overline{)40020}$ **6670**
13. $8 \overline{)65324}$ **8165 R4**
14. $9 \overline{)81819}$ **9091**
15. $3 \overline{)25503}$ **8501**
16. $7 \overline{)61982}$ **8854 R4**
17. $4 \overline{)36327}$ **9081 R3**
18. $5 \overline{)11225}$ **2245**
19. $8 \overline{)10628}$ **1328 R4**
20. $9 \overline{)45657}$ **5073**
21. $3 \overline{)29125}$ **9708 R1**
22. $6 \overline{)35460}$ **5910**
23. $2 \overline{)18096}$ **9048**
24. $5 \overline{)25434}$ **5086 R4**
25. $9 \overline{)18291}$ **2032 R3**
26. $8 \overline{)17513}$ **2189 R1**
27. $6 \overline{)55315}$ **9219 R1**
28. $4 \overline{)25632}$ **6408**

Divide. Check your answer.

29. $15012 \div 3$ **5004**
30. $49002 \div 7$ **7000 R2**
31. $32016 \div 4$ **8004**
32. $80008 \div 9$ **8889 R7**

Solve.

33. Mrs. Spencer sold her potatoes in 4 kg bags. She sold 8036 kg of potatoes for \$5.00 per bag. How many bags did she sell? **2009**
How much money did she take in? **\$10 045**

REVIEW

- A16 1. $17 \div 4$ **4 R1** 2. $39 \div 4$ **9 R3** 3. $67 \div 8$ **8 R3** 4. $89 \div 9$ **9 R8**
- A17 5. $53 \div 3$ **17 R2** 6. $37 \div 2$ **18 R1** 7. $480 \div 7$ **68 R4** 8. $355 \div 8$ **44 R3**
- A18 9. $8 \overline{)976}$ **122** 10. $9 \overline{)7064}$ **784 R8** 11. $4 \overline{)8472}$ **2118** 12. $5 \overline{)6773}$ **1354 R3**
- A19 13. $3 \overline{)602}$ **200 R2** 14. $5 \overline{)5112}$ **1022 R2** 15. $4 \overline{)4036}$ **1009** 16. $3 \overline{)12007}$ **4002 R1**

81

Assigning the Practice

Minimum: 1-28

Average: 1-20, 29-30

Enriched: 9-33

Review Exercises

Questions	Objective	Pages
1-4	A-16	74-75
5-8	A-17	76-77
9-12	A-18	78-79
13-16	A-19	80-81

Reinforcement

Complete the division and fill in the missing digits.

1.
$$\begin{array}{r} \square 09 \\ 7 \overline{)3564} \\ -\square\square \\ \hline \square 6\square \\ -\square\square \\ \hline \square \end{array}$$
2.
$$\begin{array}{r} 7\square\square \\ 9 \overline{)6\square 42} \\ -63 \\ \hline 2\square \\ -18 \\ \hline \square\square \\ -54 \\ \hline \square \end{array}$$

Who Am I?

3. If you multiply me by 8, you get 4048.
4. If you multiply me by 9, you get 4554.

Enrichment

1. Divide 98 901 by 9. What do you notice?
2. Find the smallest number which when divided by 10 the remainder is 9, when divided by 9 the remainder is 8, when divided by 8 the remainder is 7, when divided by 7 the remainder is 6, and so on, until when divided by 2 the remainder is one. Hint! Make lists.
Numbers when divided by 10 have remainders of 9,
9, 19, 29, 39, 49, 59, 69, 79, 89, 99...
Numbers when divided by 9 have remainders of 8,
17, 26, 35, 44, 53, 62, 71, 80, 89, 98,...
3. Use only the number 4 key on the calculator and the following keys $+$, $-$, \times , \div , $=$. Make the number 17 appear on the display.
Example

Extra Practice

Worksheet A19

Pages 80-81

Find the quotient. Check your answer.

1. $3 \overline{)6150}$ **2050**
2. $5 \overline{)5432}$ **1086 R2**
3. $6 \overline{)9001}$ **1500 R1**
4. $4 \overline{)8006}$ **2001 R2**
5. $4 \overline{)20228}$ **5057**
6. $6 \overline{)54180}$ **9030**
7. $8 \overline{)20001}$ **2500 R1**
8. $7 \overline{)35101}$ **5014 R3**
9. $8 \overline{)76072}$ **9509**
10. $3 \overline{)11210}$ **3736 R2**
11. $7 \overline{)49007}$ **7001**
12. $5 \overline{)24540}$ **4908**

ve.

- Mr. Bentley worked on a special job for 9 days. He received \$972.00 in salary. How much money did he make each day?

\$108

Objective A20

Divide a three- or a four-digit dividend by a multiple of ten.

Introducing the Lesson

Review *multiplying by ten* with a quick drill in which the students must do the calculations mentally. Use examples like: 8×10 , 6×10 , 14×10 , 33×10 , 252×10 , 6522×10 . Point out the pattern of adding a zero.

List the following numbers on the chalkboard for the students to *divide by ten* mentally: 60, 90, 140, 260, 3350. Note the pattern of taking off a zero.

Have the students practise counting by 20s, 30s, 40s, 50s, and so on.

Teaching the Lesson

Read and discuss the problem at the top of page 82. With play money count by 20s to \$375.00 to see how many twenty-dollar bills there are in \$375.00.

$$18 \times \$20.00 = \$360.00$$

Eighteen twenty-dollar bills and \$15.00 in smaller bills.

Record at the chalkboard and discuss each step of the long division involved.

1. Estimate as close as you can. $37 \div 20 \approx 1$
2. Multiply. $1 \times 20 = 20$
3. Subtract. $37 - 20 = 17$
4. Compare. The remainder is less than the divisor: $17 < 20$.
5. Bring down the 5.
6. Estimate as close as you can. $175 \div 20 \approx 8$
7. Multiply. $8 \times 20 = 160$
8. Subtract. $175 - 160 = 15$
9. Compare. The remainder is less than the divisor: $15 < 20$.

Check the answer:

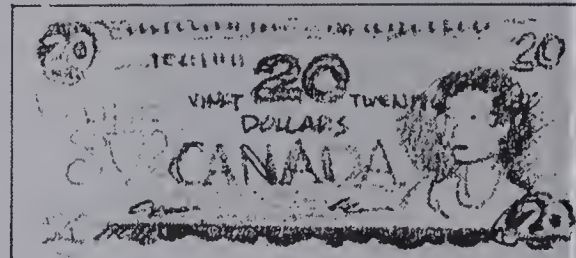
$$\text{quotient} \times \text{divisor} + \text{remainder} = \text{dividend.}$$

$$18 \times 20 + 15 = 375$$

Provide practice with several other divisions with multiples of ten as divisors. Show the students how they can use their counting skills to estimate their divisors.

Dividing by Multiples of Ten

At the end of a market day, Freda cashed the \$375 she received in cheques. She wanted as many \$20 bills as possible. How many \$20 bills could she get?



$$\$375 \div \$20 = \blacksquare$$

	Estimate.	Multiply and subtract.	Estimate.	Multiply and subtract.
$20 \overline{)375}$	$20 \overline{)375}$ 1	$20 \overline{)375}$ -20 17	$20 \overline{)375}$ -20 175	$20 \overline{)375}$ -20 175 -160 15

She received eighteen \$20 bills (and \$15 in smaller bills).

$$\text{Check: } 18 \times 20 + 15 = 375$$

EXERCISES

Divide.

1. $10 \overline{)430}$ 43
2. $20 \overline{)560}$ 28
3. $50 \overline{)750}$ 15
4. $30 \overline{)930}$ 31
5. $40 \overline{)938}$ $23R18$
6. $30 \overline{)684}$ $22R24$
7. $60 \overline{)795}$ $13R15$
8. $50 \overline{)538}$ $10R38$
9. $50 \overline{)220}$ $4R20$
10. $40 \overline{)138}$ $3R18$
11. $80 \overline{)172}$ $2R12$
12. $70 \overline{)561}$ $8R1$
13. $40 \overline{)1608}$ $40R8$
14. $50 \overline{)3592}$ $71R42$
15. $70 \overline{)6543}$ $93R53$
16. $20 \overline{)1267}$ $63R7$

Find the quotient. Check your answer.

17. $3672 \div 80$ $45R72$
18. $1446 \div 70$ $20R46$
19. $2005 \div 30$ $66R25$
20. $3004 \div 50$ $60R4$

Using the Exercises

- Questions 1 to 16 involve dividing by multiples of ten. See that the students align the numbers properly. This is especially important since none of the quotients have as many digits as the dividends.
- Questions 17 to 20 are written in horizontal form and must be set up in vertical form by the students. Emphasize that answers should be checked.

PRACTICE

Find the quotient. Check your answer.

1. $10 \overline{)530}$ 53
2. $20 \overline{)640}$ 32
3. $30 \overline{)690}$ 23
4. $50 \overline{)950}$ 19
5. $20 \overline{)362}$ $18R2$
6. $80 \overline{)573}$ $7R13$
7. $70 \overline{)224}$ $3R14$
8. $40 \overline{)885}$ $22R5$
9. $90 \overline{)813}$ $9R3$
10. $60 \overline{)479}$ $7R59$
11. $50 \overline{)945}$ $18R45$
12. $80 \overline{)605}$ $7R45$
13. $30 \overline{)1102}$ $36R22$
14. $50 \overline{)4319}$ $86R19$
15. $70 \overline{)1029}$ $14R49$
16. $90 \overline{)4506}$ $50R6$
17. $1758 \div 30$ $58R18$
18. $6486 \div 70$ $92R46$
19. $4347 \div 60$ $72R27$
20. $7956 \div 90$ $88R36$
21. $1130 \div 50$ $22R30$
22. $2872 \div 40$ $71R32$
23. $2865 \div 80$ $35R65$
24. $1345 \div 70$ $19R15$

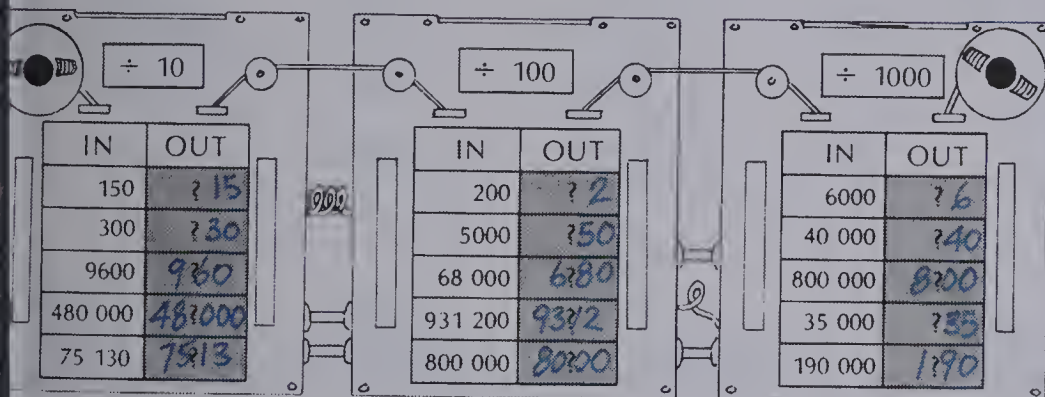
Copy and complete. Use $<$, $=$, or $>$.

25. $1440 \div 30 \bullet 3840 \div 80 =$
26. $6160 \div 80 \bullet 7020 \div 90 <$
27. $1850 \div 50 \bullet 1360 \div 40 >$
28. $3640 \div 70 \bullet 3120 \div 60 =$

Solve.

29. How many \$20 bills could you receive for a \$1780 cheque? 89
30. How many \$10 bills could you receive for a \$1000 cheque? 100
31. How many \$50 bills could you receive for a \$3150 cheque? 63

Computer Tutor



83

Assigning the Practice

Minimum: 1-16

Average: 1-24, 29-31

Enriched: 9-31

Reinforcement

For every pair of multiplication facts, there are two pairs of related division facts.

e.g. $8 \times 9 = 72$ $\left\{ \begin{array}{l} 72 \div 8 = 9 \\ 72 \div 9 = 8 \end{array} \right.$

Write the two related division facts for each pair of multiplication facts.

1. $10 \times 98 = 980$
2. $20 \times 44 = 880$
3. $30 \times 52 = 1560$
4. $40 \times 235 = 9400$
5. $326 \times 50 = 16\ 300$
6. $47 \times 10 = \underline{\hspace{1cm}}$
7. $56 \times 20 = \underline{\hspace{1cm}}$
8. $70 \times 231 = \underline{\hspace{1cm}}$
9. $60 \times 425 = \underline{\hspace{1cm}}$
10. $50 \times 362 = \underline{\hspace{1cm}}$

Find the number for each $\underline{\hspace{1cm}}$.

11. $84 \div 10 = \underline{\hspace{1cm}}$
12. $33 \div 20 = \underline{\hspace{1cm}}$
13. $45 \div 50 = \underline{\hspace{1cm}}$

Enrichment

1. Assign Computer Tutor at the bottom of page 83. Patterns made when dividing by 10 in the lesson are extended to dividing by 100 and 1000.

2. Use a calculator to divide 11 111 111 by 2, then by 3, 4, 5, 6, 7, 8, and 9. What patterns do you notice?

Extra Practice

Find the quotient. Check your answer.

1. $20 \overline{)340}$ 17
2. $30 \overline{)624}$ $20R24$
3. $50 \overline{)647}$ $12R47$
4. $80 \overline{)351}$ $4R31$
5. $70 \overline{)2100}$ 30
6. $90 \overline{)8652}$ $96R12$
7. $20 \overline{)4960}$ 248
8. $60 \overline{)7953}$ $132R33$
9. $50 \overline{)2576}$ $51R26$
10. $80 \overline{)7725}$ $96R45$
11. $90 \overline{)1162}$ $12R82$
12. $30 \overline{)2490}$ 83

Solve.

How many \$10 bills could you receive for a \$670 cheque?

67

How many \$20 bills could you receive for a \$9980 cheque?

499

Worksheet A20

Pages 82-83

UNIT 4 LESSON 6

Objective A21

Divide a three-digit dividend by a two-digit divisor with a one-digit quotient.

Introducing the Lesson

Review rounding two-digit numbers to the nearest ten at the chalkboard.

68 rounds to 70 because the number \uparrow to the right of the 6 is 5 or more.

92 rounds to 90 because the number \uparrow to the right of the 9 is less than 5.

45 rounds to 50 because the number \uparrow to the right of the 4 is 5 or more.

Have the students practise several similar examples.

Teaching the Lesson

Read and discuss the problem at the top of page 84. Explain the steps of the long division shown on the page. Point out that the estimate of 10 for the quotient was reasonable, but too large. Explain that long division often involves trying out different quotients as you estimate.

Write the following division on the chalkboard and discuss the steps required for its solution. Stress how rounding the divisor to the nearest ten helps you to make a good estimate.

1. Estimate as close as you can. Round the divisor to $59 \overline{)413}$ the nearest ten.

How many 60s are there in 413?

$60 \times 6 = 360$, $60 \times 7 = 420$
Try 6 as a trial quotient.

2. Multiply 6×59 .
3. Subtract $413 - 354$.
4. Compare. The remainder is **not** less than the divisor.

Try 7 as a trial quotient.

2. Multiply 7×59 .
3. Subtract $413 - 413$.

Show how the quotient is checked.

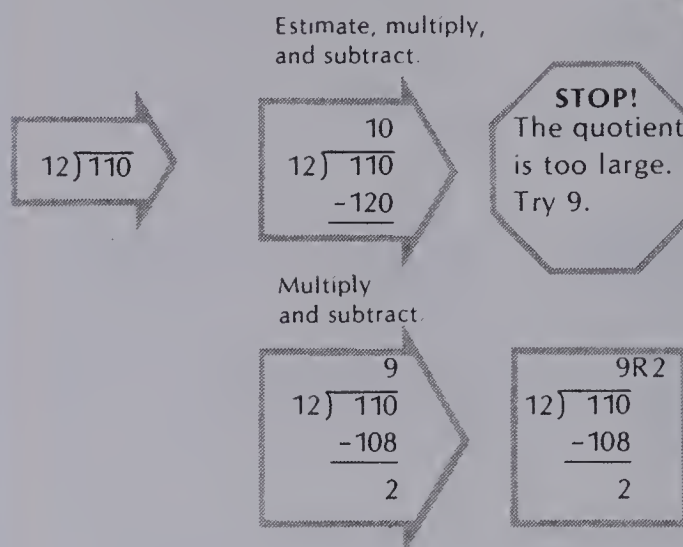
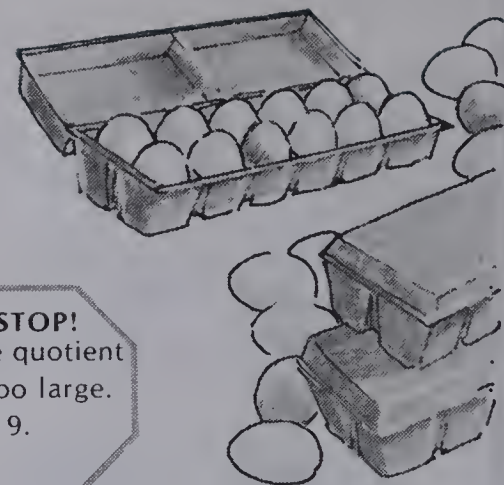
$$7 \times 59 = 413$$

Have the students practise several similar examples.

Two-Digit Divisors

How many dozen do 110 eggs make?

$$110 \div 12 = \blacksquare$$



110 eggs make 9 dozen. Two eggs are left over.

EXERCISES

Divide.

- | | | | |
|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 1. $30 \overline{)147}$ 4R27 | 2. $31 \overline{)147}$ 4R23 | 3. $50 \overline{)268}$ 5R18 | 4. $49 \overline{)268}$ 5R23 |
| 5. $70 \overline{)324}$ 4R44 | 6. $72 \overline{)324}$ 4R36 | 7. $60 \overline{)538}$ 8R58 | 8. $55 \overline{)538}$ 9R43 |
| 9. $20 \overline{)147}$ 7R7 | 10. $19 \overline{)147}$ 7R14 | 11. $90 \overline{)532}$ 5R82 | 12. $93 \overline{)532}$ 5R67 |
| 13. $80 \overline{)245}$ 3R5 | 14. $77 \overline{)245}$ 3R14 | 15. $50 \overline{)151}$ 3R1 | 16. $54 \overline{)151}$ 2R43 |
| 17. $11 \overline{)106}$ 9R7 | 18. $63 \overline{)528}$ 8R4 | 19. $45 \overline{)300}$ 6R30 | 20. $59 \overline{)472}$ 8 |

Using the Exercises

- Questions 1 to 16 are paired so that the first of the two divisions in each pair has the divisor rounded to the nearest ten. This should point out the need for rounding to help make the estimate of the trial quotient as close to correct as possible.
- Questions 17 to 20 require the student to do the rounding of the divisor on his or her own.

PRACTICE

Find the quotient. Check your answer.

1. $60 \overline{)153}$ $2R33$
2. $62 \overline{)153}$ $2R29$
3. $20 \overline{)135}$ $6R15$
4. $18 \overline{)135}$ $7R9$
5. $32 \overline{)265}$ $8R9$
6. $79 \overline{)463}$ $5R68$
7. $91 \overline{)147}$ $1R56$
8. $39 \overline{)316}$ $8R4$
9. $75 \overline{)412}$ $5R37$
10. $68 \overline{)507}$ $7R31$
11. $28 \overline{)129}$ $4R17$
12. $59 \overline{)432}$ $7R19$
13. $78 \overline{)551}$ $7R5$
14. $19 \overline{)107}$ $5R12$
15. $86 \overline{)752}$ $8R64$
16. $35 \overline{)225}$ $6R15$
17. $786 \div 92$
18. $531 \div 78$
19. $403 \div 51$
20. $238 \div 42$ $5R28$
21. $156 \div 25$ $6R6$
22. $374 \div 86$ $4R30$
23. $419 \div 75$ $5R44$
24. $539 \div 94$ $5R69$

For each checking statement, write a corresponding division.

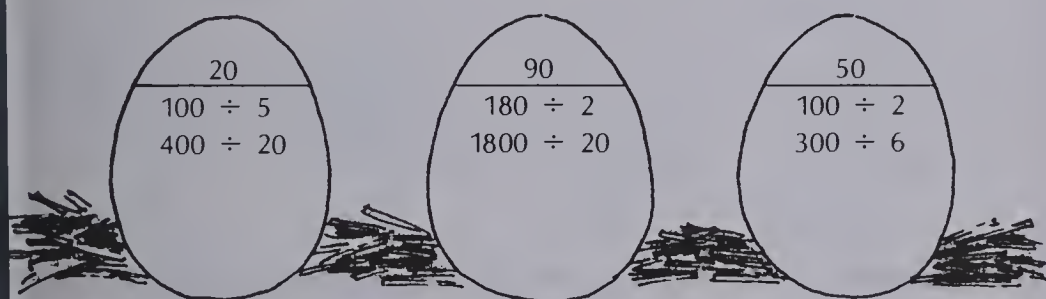
25. $4 \times 22 + 6 = 94$ $94 \div 22 = 4R6$
26. $2 \times 46 + 0 = 92$ $92 \div 46 = 2$
27. $8 \times 55 + 43 = 483$ $483 \div 55 = 8R43$
28. $9 \times 78 + 65 = 767$ $767 \div 78 = 9R65$

Solve.

29. How many quarters can you get for 195¢? 7
30. A butcher sold \$405 worth of steaks at the market. If there were 45 kg sold, what was the price per kilogram? $\$9.00$
31. For the product 511, one factor is 73. What is the other factor? 7

Division Names

Can you find 10 division names for 20, 90, and 50?
Study the examples.



85

Extra Practice

Find the quotient. Check your answer.

1. $40 \overline{)165}$ $4R5$
2. $92 \overline{)618}$ $6R66$
3. $39 \overline{)243}$ $6R9$
4. $68 \overline{)272}$ 4
5. $43 \overline{)348}$ $8R4$
6. $18 \overline{)117}$ $6R9$
7. $72 \overline{)504}$ 7
8. $84 \overline{)726}$ $8R54$
9. $13 \overline{)101}$ $7R10$
10. $26 \overline{)676}$ 26
11. $23 \overline{)209}$ $9R2$
12. $57 \overline{)342}$ 6

e.

For the product of 304, one factor is 38. What is the other factor?

8

If one factor is 675 and another is 25, what is their product?

16875

Assigning the Practice

Minimum: 1-16

Average: 1-12, 25-31

Enriched: 9-31

Reinforcement

Complete each division problem. Look for patterns that help you divide.

1. $20 \overline{)20}$ $20 \overline{)40}$ $20 \overline{)80}$ $20 \overline{)100}$
 $20 \overline{)200}$ $20 \overline{)400}$ $20 \overline{)600}$ $20 \overline{)240}$
2. $30 \overline{)30}$ $30 \overline{)60}$ $30 \overline{)90}$ $30 \overline{)300}$
 $30 \overline{)600}$ $30 \overline{)900}$ $30 \overline{)120}$ $30 \overline{)150}$
3. $40 \overline{)40}$ $40 \overline{)80}$ $40 \overline{)800}$ $40 \overline{)120}$
 $40 \overline{)200}$ $40 \overline{)240}$ $40 \overline{)280}$ $40 \overline{)320}$
4. $50 \overline{)50}$ $50 \overline{)100}$ $50 \overline{)200}$ $50 \overline{)300}$
 $50 \overline{)400}$ $50 \overline{)500}$ $50 \overline{)600}$ $50 \overline{)700}$
5. $60 \overline{)60}$ $60 \overline{)120}$ $60 \overline{)180}$ $60 \overline{)240}$
 $60 \overline{)300}$ $60 \overline{)360}$ $60 \overline{)420}$ $60 \overline{)600}$
6. $70 \overline{)70}$ $70 \overline{)140}$ $70 \overline{)210}$ $70 \overline{)280}$
 $70 \overline{)350}$ $70 \overline{)420}$ $70 \overline{)490}$ $70 \overline{)700}$
7. $80 \overline{)80}$ $80 \overline{)160}$ $80 \overline{)240}$ $80 \overline{)320}$
 $80 \overline{)400}$ $80 \overline{)480}$ $80 \overline{)560}$ $80 \overline{)800}$

Enrichment

1. Assign *Division Names* at the bottom of page 85. Display all of the different names that are found.
2. Find three 3-digit numbers which, when divided by 50, give a remainder of 1, 2, 3, or 4.
3. Find three 3-digit numbers which, when divided by 70, give a remainder of 1, 2, 3, 4, 5, or 6.

Worksheet A21

Pages 84-85

Find the quotient. Check your answer.

1. $40 \overline{)165}$ $4R5$
2. $92 \overline{)618}$ $6R66$
3. $39 \overline{)243}$ $6R9$
4. $68 \overline{)272}$ 4
5. $43 \overline{)348}$ $8R4$
6. $18 \overline{)117}$ $6R9$
7. $72 \overline{)504}$ 7
8. $84 \overline{)726}$ $8R54$
9. $13 \overline{)101}$ $7R10$
10. $26 \overline{)676}$ 26
11. $23 \overline{)209}$ $9R2$
12. $57 \overline{)342}$ 6

e.

For the product of 304, one factor is 38. What is the other factor?

8

If one factor is 675 and another is 25, what is their product?

16875

Objective A22

Divide a three- or four-digit dividend by a two-digit divisor with a two-digit quotient.

Introducing the Lesson

Review rounding the divisor to the nearest ten as you estimate a quotient with several chalkboard examples.

$$19 \overline{)163}$$

$$20 \overline{)163} \quad 20 \times 8 = 160$$

$$\begin{array}{r} 8 \\ 19 \overline{)163} \\ \underline{152} \\ 11 \end{array}$$

Try 8 as a trial quotient.
Multiply. Subtract. Compare.
Check: $8 \times 19 + 11 = 163$

Teaching the Lesson

Read and discuss the problem at the top of page 86. Explain the steps of the long division needed for the solution at the chalkboard.

- Estimate. Round 18 to 20.

$$20 \overline{)1008} \quad 20 \times 5 = 100$$

Try 5 as a trial quotient.
- Multiply. Subtract. Compare.

$$\begin{array}{r} 56 \\ 18 \overline{)1008} \\ \underline{-90} \\ 108 \\ \underline{-108} \\ 0 \end{array}$$

Bring down the 8.
- Estimate.

$$5 \times 18 = 90$$

$$6 \times 18 = 108$$

- Multiply. Subtract. Compare.

Continue to emphasize the importance of checking the quotient.
 $\text{quotient} \times \text{divisor} = \text{dividend}$
 $56 \times 18 = 1008$

Have the students practise several similar examples on an overhead projector. Ask them to come to the projector one at a time to do only one step of a long division. As each step is done, the student explains his or her actions. Clear up difficulties as they arise.

Two-Digit Divisors

For the farmers' banquet and dance that was held after the harvest, \$1008 was collected. If the tickets for each couple were \$18, how many couples attended the banquet and dance?



Estimate, multiply, and subtract.

Estimate, multiply and subtract.

$$18 \overline{)1008}$$

$$\begin{array}{r} 5 \\ 18 \overline{)1008} \\ \underline{-90} \\ 108 \\ \underline{-108} \\ 0 \end{array}$$

$$\begin{array}{r} 56 \\ 18 \overline{)1008} \\ \underline{-90} \\ 108 \\ \underline{-108} \\ 0 \end{array}$$

Check:

$$\begin{array}{r} 56 \\ \times 18 \\ \hline 448 \\ 56 \\ \hline 1008 \end{array}$$

56 couples attended the banquet and dance.

EXERCISES

Tell what is wrong with the first division. Complete the second division.

- $$\begin{array}{r} 7 \\ 34 \overline{)2210} \\ \underline{-238} \end{array}$$

7 too large

$$\begin{array}{r} 65 \\ 34 \overline{)2210} \\ \underline{-238} \end{array}$$
 - $$\begin{array}{r} 7 \\ 23 \overline{)1518} \\ \underline{-161} \end{array}$$

7 too large

$$\begin{array}{r} 66 \\ 23 \overline{)1518} \\ \underline{-161} \end{array}$$
 - $$\begin{array}{r} 6 \\ 54 \overline{)3024} \\ \underline{-324} \end{array}$$

6 too large

$$\begin{array}{r} 56 \\ 54 \overline{)3024} \\ \underline{-324} \end{array}$$
 - $$\begin{array}{r} 6 \\ 85 \overline{)6290} \\ \underline{-510} \end{array}$$

6 too small

$$\begin{array}{r} 74 \\ 85 \overline{)6290} \\ \underline{-510} \end{array}$$
- Divide.
- $$\begin{array}{r} 11R29 \\ 43 \overline{)502} \end{array}$$
 - $$\begin{array}{r} 14R15 \\ 55 \overline{)785} \end{array}$$
 - $$\begin{array}{r} 21R25 \\ 32 \overline{)697} \end{array}$$
 - $$\begin{array}{r} 34 \\ 29 \overline{)986} \end{array}$$
 - $$\begin{array}{r} 78R24 \\ 44 \overline{)3456} \end{array}$$
 - $$\begin{array}{r} 59 \\ 57 \overline{)3363} \end{array}$$
 - $$\begin{array}{r} 99R46 \\ 68 \overline{)6778} \end{array}$$
 - $$\begin{array}{r} 84 \\ 79 \overline{)6636} \end{array}$$

Using the Exercises

- Questions 1 to 4 should be accompanied by discussion. Each of the divisions has a trial quotient which is either too large or too small. For each problem, have the students point out the reason why the trial quotient will not work, name a better quotient, and finish the division. Stress the importance of the "compare" step in long division.
- Questions 5 to 12 involve two-digit divisors and quotients. Some of these problems should be worked along with class discussion and some should be done independently and discussed after completion.

PRACTICE

Find the quotient. Check your answer.

1. $12 \overline{)625}$ $52R1$
2. $24 \overline{)696}$ 29
3. $37 \overline{)721}$ $19R18$
4. $43 \overline{)817}$ 19
5. $15 \overline{)1003}$ $66R13$
6. $27 \overline{)2134}$ $79R1$
7. $34 \overline{)3000}$ $88R8$
8. $46 \overline{)4321}$ $93R43$
9. $95 \overline{)8900}$ $93R65$
10. $69 \overline{)5238}$ $75R63$
11. $16 \overline{)1425}$ $89R1$
12. $23 \overline{)2003}$ $87R2$
13. $78 \overline{)6325}$ $81R7$
14. $49 \overline{)3149}$ $64R13$
15. $67 \overline{)2245}$ $33R34$
16. $83 \overline{)7061}$ $85R6$
17. $99 \overline{)4532}$ $45R77$
18. $75 \overline{)6009}$ $80R9$
19. $24 \overline{)1326}$ $55R6$
20. $35 \overline{)2605}$ $74R15$
21. $5678 \div 64$ $88R46$
22. $5000 \div 51$ $98R2$
23. $936 \div 78$ 12
24. $2832 \div 59$ 48

Copy and complete. Use = or \neq .

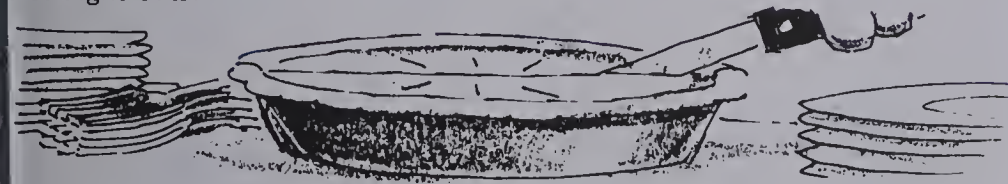
25. $416 \div 32 \bullet 975 \div 75$ $=$
26. $289 \div 17 \bullet 666 \div 37$ \neq
27. $1246 \div 89 \bullet 336 \div 24$ $=$
28. $583 \div 53 \bullet 552 \div 46$ \neq

Solve.

29. \$6000 is shared by 75 people. How much does each person get? $\$80$
30. 675 kg of potatoes are put into 45 sacks. How many kilograms does each sack hold? 15 kg

Cutting the Pie

What is the greatest number of pieces you could cut this pie into with 3 straight cuts? 6



Draw several circles and try a few different ways.

Try to cut a pie into 11 pieces with 4 straight cuts.

87

Assigning the Practice

Minimum: 1-20

Average: 1-24, 29-30

Enriched: 9-30

Reinforcement

Complete each division. Look for patterns that help you divide.

1. $20 \overline{)200}$ $20 \overline{)2000}$ $20 \overline{)240}$
 $20 \overline{)2400}$ $22 \overline{)240}$ $23 \overline{)2450}$
 $30 \overline{)300}$ $30 \overline{)3000}$ $30 \overline{)6000}$
 $30 \overline{)320}$ $31 \overline{)3500}$ $34 \overline{)6000}$

2. Who Am I?

- a. If you multiply me by 38, you get 1786.
- b. If you multiply me by 56, you get 4200.
- c. If you multiply me by 83, you get 5312.
- d. If you multiply me by 76, you get 5016.

Enrichment

1. Assign *Cutting the Pie* at the bottom of page 87. Ask the students to draw a diagram of their solutions.
2. Do the following four steps on a calculator.
 - a. Choose any 3-digit number. Repeat the same digits and make a 6-digit number.
Example: 456 456 456
 - b. Divide the 6-digit number by 7.
 - c. Divide the quotient in step b by 11.
 - d. Divide the quotient in step c by 13.
 Repeat these steps with other 3-digit numbers. What do you notice?
 (The answer is always the original 3-digit number.)

Extra Practice

Worksheet A22

Pages 86-87

Find the quotient. Check your answer.

1. $18 \overline{)367}$ $20R7$
2. $26 \overline{)985}$ $37R23$
3. $32 \overline{)448}$ 14
4. $13 \overline{)883}$ $67R12$
5. $38 \overline{)2652}$ $69R30$
6. $45 \overline{)3785}$ $84R5$
7. $87 \overline{)5622}$ $64R54$
8. $99 \overline{)8301}$ $83R84$
9. $65 \overline{)4056}$ $62R26$
10. $68 \overline{)1836}$ 27
11. $75 \overline{)2077}$ $27R52$
12. $37 \overline{)3145}$ 85

Solve.

If 1904 is the dividend and 34 is the divisor, what is the quotient?

56

If 5695 is the dividend and 67 is the quotient, what is the divisor?

85

UNIT 4 LESSON 8

Objective A23

Divide a four- or five-digit dividend by a two-digit divisor with a three-digit quotient.

Introducing the Lesson

Review rounding numbers to the nearest ten by flashing two-digit numeral cards and asking the students to round them.

Review counting by 10s, 20s, 30s, 40s, 50s, etc. Ask the students to count individually and in groups.

Teaching the Lesson

Point out the problem at the top of page 88. Discuss the long division steps needed for the solution at the chalkboard.

1. Estimate. The trial quotient of 1 is easy to find.
2. Multiply 1×38 .
3. Subtract $46 - 38$.
4. Compare.
5. Bring down the 7.

$$\begin{array}{r} 1 \\ 38 \overline{) 4674} \\ \underline{-38} \\ 87 \end{array}$$

1. Estimate. Round 38 to 40.

$$40 \overline{) 87} \quad 40 \times 2 = 80$$

Try 2 as a trial quotient.

2. Multiply 2×38 .
3. Subtract $87 - 76$.
4. Compare.
5. Bring down the 4.

$$\begin{array}{r} 12 \\ 38 \overline{) 4674} \\ \underline{-38} \\ 87 \\ \underline{-76} \\ 114 \end{array}$$

1. Estimate. Round 38 to 40.

$$40 \overline{) 114} \quad \begin{array}{l} 40 \times 2 = 80 \\ 40 \times 3 = 120 \end{array}$$

The estimate indicates that 2 should be the trial quotient. Yet, the last multiplication was $2 \times 38 = 76$.

Try 3 as the trial quotient.

2. Multiply 3×38 .
3. Subtract $114 - 114$.

$$\begin{array}{r} 123 \\ 38 \overline{) 4674} \\ \underline{-38} \\ 87 \\ \underline{-76} \\ 114 \\ \underline{-114} \\ 0 \end{array}$$

Write several similar examples on the chalkboard. Ask the students to round the divisor and the dividend and then estimate the quotient. Have the students check their estimates by working out each division to the exact answer. Pass out graph paper for them to write on as an aid to good number alignment.

Two-Digit Divisors

The Harrisons sold 38 of their pigs for \$4674. What was the price of each pig?
 $\$4674 \div 38 = \blacksquare$



Estimate, multiply, and subtract.

Estimate, multiply and subtract.

Estimate, multiply and subtract.

$$38 \overline{) 4674}$$

$$\begin{array}{r} 1 \\ 38 \overline{) 4674} \\ \underline{-38} \\ 8 \end{array}$$

$$\begin{array}{r} 12 \\ 38 \overline{) 4674} \\ \underline{-38} \\ 87 \\ \underline{-76} \\ 11 \end{array}$$

$$\begin{array}{r} 123 \\ 38 \overline{) 4674} \\ \underline{-38} \\ 87 \\ \underline{-76} \\ 114 \\ \underline{-114} \\ 0 \end{array}$$

The price of each pig was \$123.

EXERCISES

Copy and complete each division.

- | | | | |
|---|---|---|--|
| 1. $13 \overline{) 2879}$
$\underline{-26}$
27 | 2. $24 \overline{) 8544}$
$\underline{-72}$
134 | 3. $33 \overline{) 7891}$
$\underline{-66}$
12 | 4. $57 \overline{) 9000}$
$\underline{-57}$
33 |
| 5. $13 \overline{) 10058}$
$\underline{-91}$
95 | 6. $34 \overline{) 29376}$
$\underline{-272}$
217 | 7. $47 \overline{) 43215}$
$\underline{-423}$
9 | 8. $58 \overline{) 52026}$
$\underline{-464}$
56 |

Divide.

- | | | | |
|---|---|---|--|
| 9. $21 \overline{) 4471}$
$\underline{212R19}$ | 10. $53 \overline{) 8692}$
$\underline{164}$ | 11. $26 \overline{) 8947}$
$\underline{344R3}$ | 12. $76 \overline{) 9576}$
$\underline{126}$ |
| 13. $43 \overline{) 11094}$
$\underline{258}$ | 14. $55 \overline{) 40000}$
$\underline{727R15}$ | 15. $67 \overline{) 55439}$
$\underline{827R30}$ | 16. $78 \overline{) 53586}$
$\underline{687}$ |

88

Using the Exercises

- Questions 1 to 8 help the student get started with the long division steps. Students should copy the work already done and continue from there.
- Questions 9 to 16 offer a little help. For the most part, however, the student must do all of the steps. See that the students place each digit of the quotient in its proper place.

PRACTICE

Find the quotient. Check your answer.

1. $15 \overline{)1875}$ 125
2. $23 \overline{)3082}$ 134
3. $34 \overline{)7324}$ $215R14$
4. $46 \overline{)9123}$ $198R15$
5. $16 \overline{)3744}$ 234
6. $24 \overline{)9825}$ $409R9$
7. $36 \overline{)8317}$ $231R1$
8. $59 \overline{)9617}$ 163
9. $54 \overline{)36612}$ 678
10. $63 \overline{)42777}$ 679
11. $78 \overline{)75579}$ $968R75$
12. $88 \overline{)45678}$ $519R6$
13. $65 \overline{)8715}$ $134R5$
14. $77 \overline{)75000}$ $974R2$
15. $53 \overline{)8639}$ 163
16. $91 \overline{)81354}$ 894

For each checking statement, write a corresponding division.

17. $37 \times 17 + 7 = 636$ $636 \div 37 = 17R7$
18. $268 \times 34 + 0 = 9112$ $9112 \div 34 = 268$
19. $768 \times 45 + 8 = 34568$ $34568 \div 45 = 768R8$
20. $874 \times 69 + 53 = 60359$ $60359 \div 69 = 874R53$

Round the divisor and dividend.

Estimate the quotient.

21. $28 \overline{)6194}$ 200
22. $62 \overline{)7578}$ 130
23. $49 \overline{)9957}$ 200
24. $19 \overline{)8564}$ 430

Solve.

25. If the dividend is 3400 and the divisor is 25, what is the quotient? 136
26. If the product is 19 845 and one factor is 21, what is the other factor? 945

Using Your Head

Complete these equations without paper and pencil.

- a. $(852 \div 1) \times 1 = \square$ 852
- b. $(97 \div 97) \times 145 = \square$ 145
- c. $(7643 \div 1) \times 0 = \square$ 0
- d. $(348 - 348) \times 1 = \square$ 0
- e. $(150 + 150) \div 1 = \square$ 300
- f. $(573 - 573) \times 573 = \square$ 0

89

Extra Practice

Worksheet A23

Pages 88-89

Find the quotient. Check your answer.

1. $67 \overline{)7028}$ $104R60$
2. $35 \overline{)8126}$ $232R6$
3. $14 \overline{)4508}$ 322
4. $23 \overline{)9384}$ 408
5. $63 \overline{)50061}$ $794R39$
6. $45 \overline{)27312}$ $606R42$
7. $51 \overline{)10557}$ 207
8. $55 \overline{)10988}$ $199R43$
9. $92 \overline{)23276}$ 253
10. $88 \overline{)10765}$ $122R29$
11. $27 \overline{)20344}$ $753R13$
12. $69 \overline{)20907}$ 303

Find and estimate.

Round the factors. Estimate the product.

$$592 \times 42 \approx 600 \times 40 = 24000$$

Round the divisor and dividend. Estimate the quotient.

$$8835 \div 28 \approx 9000 \div 30 = 300$$

Assigning the Practice

Minimum: 1-16, 25-26

Average: 5-26

Enriched: 9-26

Reinforcement

Complete the division.

1. $34 \overline{)3356}$
 $\square\square\square$
 $29\square$
 -272
 $\square\square$
2. $27 \overline{)18\square6}$
 -162
 $\square1\square$
 $- \square\square\square$
 \square
3. $53 \overline{)4555}$
 -424
 $\square\square\square$
 -265
 $\square\square$

4. Make up three missing number division problems like questions 1, 2, and 3.
5. Exchange your three problems with another student.

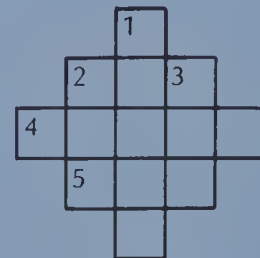
6. Make up three division problems with mistakes in them. Exchange with another student and find the errors.

Example:

$$\begin{array}{r} 75 \text{ error} \\ 54 \overline{)3954} \\ -378 \\ \hline 274 \\ \text{error} \quad 270 \text{ error} \\ \hline 4 \text{ error} \end{array}$$

Enrichment

1. Assign *Using Your Head* at the bottom of page 89. Students should discover the properties of zero and one.
2. Complete the cross-number puzzle.



Across

2. $3336 \div 24$
4. 25×737
5. $(9 + 9)^2$

Down

1. 1114×30
2. $17934 \div 98$
3. Eggs in 77 dozen

Objective A24

Divide a five-digit dividend by a two-digit divisor with a four-digit quotient.

Introducing the Lesson

Begin a discussion of salaries. Have the students tell about earnings they have made for babysitting, cutting lawns, etc. List on the chalkboard the earnings as they are mentioned and the number of hours worked. Point out that by dividing the daily earnings by the number of hours worked one can determine the earnings per hour for each.

Teaching the Lesson

Read and discuss the problem at the top of page 90. Have a student explain that the monthly earnings of the farmer can be found by dividing the yearly earnings by 12. Write the division on the chalkboard and discuss each step. Show how looking at the previous multiplication steps in the problem can help one to decide on the next trial quotient.

$$\begin{array}{r} 18 \\ 12 \overline{) 22500} \\ \underline{-12} \\ 105 \\ \underline{-96} \\ 90 \end{array}$$

90 ÷ 12 = ?
8 × 12 is 96.
Try 7 × 12 as the next trial quotient.

Stress the importance of checking answers, especially with divisions involving large numbers.

List a few yearly salaries for various occupations on the chalkboard. Have the students work in pairs or small groups and determine the monthly and weekly salaries for each.

Two-Digit Divisors

A farmer made \$22 500 in one year.
How much is that per month?

$$\$22\,500 \div 12 = \blacksquare$$



$\begin{array}{r} 1 \\ 12 \overline{) 22500} \\ \underline{-12} \\ 105 \end{array}$	$\begin{array}{r} 18 \\ 12 \overline{) 22500} \\ \underline{-12} \\ 105 \\ \underline{-96} \\ 90 \end{array}$	$\begin{array}{r} 187 \\ 12 \overline{) 22500} \\ \underline{-12} \\ 105 \\ \underline{-96} \\ 90 \\ \underline{-84} \\ 60 \end{array}$	$\begin{array}{r} 1875 \\ 12 \overline{) 22500} \\ \underline{-12} \\ 105 \\ \underline{-96} \\ 90 \\ \underline{-84} \\ 60 \\ \underline{-60} \\ 0 \end{array}$	Check: $\begin{array}{r} 1875 \\ \times 12 \\ \hline 3750 \\ 1875 \\ \hline 22500 \end{array}$
--	--	--	---	---

The farmer made \$1875 per month.

EXERCISES

Copy and complete each division.

- | | | | |
|--|---|---|---|
| 1. $\begin{array}{r} 24 \text{ R } 12 \\ 19 \overline{) 46125} \\ \underline{-38} \\ 81 \\ \underline{-76} \\ 52 \end{array}$ | 2. $\begin{array}{r} 16 \text{ R } 42 \\ 58 \overline{) 97482} \\ \underline{-58} \\ 394 \\ \underline{-348} \\ 468 \end{array}$ | 3. $\begin{array}{r} 25 \text{ R } 63 \\ 31 \overline{) 79453} \\ \underline{-62} \\ 174 \\ \underline{-155} \\ 195 \end{array}$ | 4. $\begin{array}{r} 14 \text{ R } 16 \\ 66 \overline{) 94000} \\ \underline{-66} \\ 280 \\ \underline{-264} \\ 160 \end{array}$ |
| 5. $\begin{array}{r} 1 \text{ R } 38 \\ 45 \overline{) 51234} \\ \underline{-45} \\ 62 \end{array}$ | 6. $\begin{array}{r} 1 \text{ R } 218 \\ 53 \overline{) 64583} \\ \underline{-53} \\ 115 \end{array}$ | 7. $\begin{array}{r} 3 \text{ R } 380 \\ 28 \overline{) 94640} \\ \underline{-84} \\ 106 \end{array}$ | 8. $\begin{array}{r} 4 \text{ R } 44 \\ 18 \overline{) 80000} \\ \underline{-72} \\ 80 \end{array}$ |
| 9. $\begin{array}{r} 6 \text{ R } 2 \\ 38 \overline{) 85172} \\ \underline{1008} \text{ R } 25 \end{array}$ | 10. $\begin{array}{r} 11 \text{ R } 5 \\ 37 \overline{) 96132} \\ \underline{2022} \text{ R } 31 \end{array}$ | 11. $\begin{array}{r} 10 \text{ R } 6 \\ 14 \overline{) 38657} \\ \underline{1001} \text{ R } 48 \end{array}$ | 12. $\begin{array}{r} 8 \text{ R } 0 \\ 21 \overline{) 67430} \\ \underline{1001} \text{ R } 65 \end{array}$ |
| 13. $\begin{array}{r} 79 \overline{) 79657} \end{array}$ | 14. $\begin{array}{r} 38 \overline{) 76867} \end{array}$ | 15. $\begin{array}{r} 55 \overline{) 55103} \end{array}$ | 16. $\begin{array}{r} 82 \overline{) 82147} \end{array}$ |

Using the Exercises

- Questions 1 to 8 have the first steps completed. Point out that they can now look at previous multiplication steps in the problem as a clue to the next trial quotient.
- Questions 9 to 16 require that all steps be completed by the student.
- Students may work on graph paper for proper number alignment.

PRACTICE

Find the quotient. Check your answer.

1. $13 \overline{)16\,042}$ 1234
2. $24 \overline{)56\,544}$ 2356
3. $32 \overline{)82\,048}$ 2564
4. $46 \overline{)89\,976}$ 1956
5. $58 \overline{)93\,032}$ 1604
6. $91 \overline{)99\,736}$ 1096
7. $47 \overline{)94\,094}$ 2002
8. $56 \overline{)80\,136}$ 1431
9. $16 \overline{)20\,521}$ $1282R9$
10. $25 \overline{)44\,365}$ $1774R15$
11. $33 \overline{)75\,319}$ $2282R13$
12. $47 \overline{)63\,918}$ $1359R45$

For each checking statement, write a corresponding division.

13. $2036 \times 15 + 0 = 30\,540$
 14. $3456 \times 28 + 6 = 96\,774$
 15. $2012 \times 46 + 3 = 92\,555$
 16. $1309 \times 69 + 9 = 90\,330$
- $30\,540 \div 15 = 2036$
 $92\,555 \div 46 = 2012R3$
 $96\,774 \div 28 = 3456R6$
 $90\,330 \div 69 = 1309R9$

Round the divisor and dividend.

Estimate the quotient.

17. $51 \overline{)57\,214}$ 1200
18. $71 \overline{)23\,576}$ 300
19. $21 \overline{)83\,465}$ 4000
20. $98 \overline{)40\,621}$ 400

21. Copy and complete the table.

Yearly salary	How much per month?	How much per week?
\$ 50 000	\$4166.67	\$961.54
\$100 000	\$8333.33	\$1923.08
\$ 18 000	\$1500.00	\$346.15

USING THE CALCULATOR

Divide with a calculator.

Round to the nearest whole number.

- a. $2\,347\,108 \div 576$ 4075
- b. $58\,104\,379 \div 4792$ $12\,125$
- c. $546\,374 \div 43$ $12\,706$
- d. $975\,198 \div 113$ 8630

91

Extra Practice

Worksheet A24

Pages 90-91

Find the quotient. Check your answer.

1. $32 \overline{)86\,240}$ 2695
2. $51 \overline{)64\,005}$ 1255
3. $78 \overline{)93\,444}$ 1198
4. $25 \overline{)63\,550}$ 2542
5. $19 \overline{)55\,005}$ 2895
6. $27 \overline{)83\,970}$ 3110
7. $39 \overline{)80\,184}$ 2056
8. $63 \overline{)65\,114}$ $1033R35$
9. $21 \overline{)92\,589}$ 4409
10. $34 \overline{)40\,652}$ $1195R22$
11. $95 \overline{)95\,190}$ 1002
12. $48 \overline{)59\,136}$ 1232

olve.

What is the weekly salary of Ms. Peters who earns \$32 000 per year?

\$615.38

What is the yearly salary of Mr. Duvik who earns \$615 per week?

\$31 980

Assigning the Practice

Minimum: 1-12

Average: 1-8, 13-21

Enriched: 5-21

Reinforcement

1. All students should try *Using the Calculator* at the bottom of page 91.
2. Use a calculator for the following problems.
 - a. Use 24 as the divisor. Find a 5-digit dividend that produces a remainder of zero.
 $1\,221 R = 0$
 $24 \overline{)29\,304}$
 - b. Use 24 as the divisor. Find a 5-digit dividend that produces a remainder of 1 (2, 3, 4).
 - c. Use 12 as the divisor. Find a 5-digit dividend that produces a remainder of 6 (3, 4).

Enrichment

Who Am I?

1. If you multiply me by 12, you get 14 808.
2. If you multiply me by 19, you get 82 099.
3. If you multiply me by 36, you get 44 370.
4. If you multiply me by 52, you get 57 798.
5. Make up a problem that has a two-digit divisor, a five-digit dividend, and a four-digit quotient (or a three-digit quotient).
6. Make up a problem that has a two-digit divisor, a five-digit dividend, and a three-digit quotient.

Objective PS4

Choose the correct operation in solving a word problem.

Introducing the Lesson

Have the students recall *key words* and *phrases* used in addition, subtraction, multiplication, and division word problems. List them on the chalkboard as they are mentioned.

Teaching the Lesson

Point out how these key words and phrases are helpful in choosing the correct operation in a word problem. Yet, explain that one must carefully read the entire problem and not just look for the key words, because sometimes they are used for more than one operation. For example, the phrase “in all” is often used in both addition and multiplication word problems.

Encourage the students to make up problems using the key words they have listed.

Problem Solving Quiz



Try this quiz. Name the operation that gives the correct answer.



1. If a woman buys 12 baskets of apples for \$54, how much does each basket cost? **division**
d a. $\$54 + 12$ b. $\$54 - 12$ c. $\$54 \times 12$ d. $\$54 \div 12$
2. A man buys 5 jugs of maple syrup at \$6 a jug. How much does he pay? **multiplication**
c a. $\$6 + 5$ b. $\$6 - 5$ c. $\$6 \times 5$ d. $\$6 \div 5$
3. Jane had \$49 in her wallet after she spent \$15 on meat. How much did she have at first? **addition**
a a. $\$49 + \15 b. $\$49 - \15 c. $\$49 \times \15 d. $\$49 \div \15
4. A farmers' market sold 6350 kg of potatoes in 10 kg bags. How many bags did they sell altogether? **division**
d a. $6350 + 10$ b. $6350 - 10$ c. 6350×10 d. $6350 \div 10$
5. Peter had \$32 in his wallet. He then spent \$25 on groceries. How much was left? **subtraction**
b a. $\$32 + \25 b. $\$32 - \25 c. $\$32 \times \25 d. $\$32 \div \25
6. The parking lot at the market has 52 rows with space for 25 cars in each row. How many spaces are there altogether? **multiplication**
c a. $52 + 25$ b. $52 - 25$ c. 52×25 d. $52 \div 25$
7. If 3007 sales of sweet corn were made at the market during the month of July, what was the average number of sales per day? **division**
d a. $3007 + 31$ b. $3007 - 31$ c. 3007×31 d. $3007 \div 31$
8. Mrs. Lorenz sold 243 bags of radishes last Saturday. This Saturday she sold 178. How many were sold altogether? **addition**
a a. $243 + 178$ b. $243 - 178$ c. 243×178 d. $243 \div 178$

92

Using the Exercises

- Questions 1 to 8 should be used as a quiz followed by discussion of those problems which were most often missed.

PRACTICE

Solve.

- Mary earned \$12 a week for babysitting. How much did she earn after 15 weeks? **\$180**
- There have been 72 school days since school started. There are 128 school days left in the year. How many school days are there in one school year? **200**
- There are 50 000 seats in a football stadium. The stadium has 25 sections — all the same size. How many seats are in each section? **2000**
- Mr. Thompson borrowed \$60 000 from the bank. So far, he has paid \$25 275 back. How much has he left to repay? **\$34 725**
- If the product is 17 628 and one factor is 26, what is the other factor? **678**
- Laura Mishko sold her crop of tomatoes for \$14 640. She got \$48 for every 100 kg of tomatoes. What was the mass of her whole crop? **30 500 kg**

PROBLEM SOLVING

Divide.

- | | | | | |
|-----|---|--|--|---|
| A20 | 1. $30 \overline{)147}$ 4R27 | 2. $20 \overline{)972}$ 48R12 | 3. $50 \overline{)3000}$ 60 | 4. $60 \overline{)1754}$ 29R14 |
| A21 | 5. $31 \overline{)147}$ 4R23 | 6. $62 \overline{)452}$ 7R18 | 7. $29 \overline{)113}$ 3R26 | 8. $91 \overline{)516}$ 5R61 |
| A22 | 9. $21 \overline{)436}$ 20R16 | 10. $57 \overline{)894}$ 15R39 | 11. $33 \overline{)2612}$ 79R5 | 12. $25 \overline{)1950}$ 78 |
| A23 | 13. $41 \overline{)9651}$ 235R16 | 14. $69 \overline{)7524}$ 109R3 | 15. $52 \overline{)47034}$ 904R26 | 16. $89 \overline{)30705}$ 345 |
| A24 | 17. $32 \overline{)32032}$ 1001 | 18. $15 \overline{)45150}$ 3010 | 19. $78 \overline{)86424}$ 1108 | 20. $54 \overline{)86921}$ 1609R35 |

93

Assigning the Practice

Minimum: 1-4

Average: 1-5

Enriched: 1-6

Review Exercises

Questions	Objective	Pages
1-4	A20	82-83
5-8	A21	84-85
9-12	A22	86-87
13-16	A23	88-89
17-20	A24	90-91

Reinforcement

1. Bikes cost \$150. Joan has \$110, how much more does she need to buy the bike? (Is this an addition or subtraction problem? Discuss.)

2. List key words that would indicate addition, subtraction, multiplication, or division.

3. Make up an addition problem, a subtraction problem, a multiplication problem, and a division problem. Ask a partner to circle the key words and solve the problem.

Enrichment

Bikes cost \$150.
Soccer Boots Cost \$50.
Joe has \$575.

From the above information make up:

- an addition problem.
- a subtraction problem.
- a multiplication problem.
- a division problem.
- a multiplication and subtraction problem.
- another problem using two operations.
- a problem using three operations.

Problem Solving Activities

Assign Level 6, Unit 4

Extra Practice

Worksheet PS4

Pages 92-93

Solve.

John received \$100.00 for his graduation. With that money he spent \$35.95 for skates, \$39.25 for a calculator, and \$16.50 for a pair of jeans. How much money did he have left?

\$8.30

Mrs. McMahon planted two tulip gardens. In her back yard she planted 3 rows with 15 tulips in each row. In her front yard she planted 7 rows with 18 tulips in each row. How many tulips did she plant in all?

171

Mr. Weaver sold his crop of beans for \$244.80. He got \$1.80 for 10 kg of beans. What was the mass of his whole crop?

1360 kg

If the quotient is 485 and the divisor is 39, what is the dividend? **18 915**

Unit 4 Objective	Test Questions	Pages
A16	1-4	74-75
A17	5-8	76-77
A18	9-12	78-79
A19	13-15	80-81
A20	16-18	82-83
A21	19-21	84-85
A22	22-24	86-87
A23	25-27	88-89
A24	28-30	90-91
PS	31-34	

TEST

UNIT 4

Find the quotient.

- $48 \div 5$ 9R3
- $37 \div 8$ 4R5
- $74 \div 9$ 8R2
- $16 \div 3$ 5R1
- $73 \div 4$ 18R1
- $87 \div 3$ 29
- $191 \div 5$ 38R1
- $603 \div 9$ 67
- $456 \div 2$ 228
- $750 \div 5$ 150
- $3429 \div 9$ 381
- $6412 \div 3$ 2137R2
- $2 \overline{)4016}$ 2008
- $7 \overline{)2803}$ 400R3
- $9 \overline{)80010}$ 8890
- $20 \overline{)163}$ 8R3
- $30 \overline{)920}$ 30R20
- $80 \overline{)6015}$ 75R15
- $18 \overline{)102}$ 5R12
- $39 \overline{)145}$ 3R28
- $63 \overline{)378}$ 6
- $51 \overline{)956}$ 18R38
- $78 \overline{)1170}$ 15
- $45 \overline{)1062}$ 23R27
- $63 \overline{)7875}$ 125
- $38 \overline{)4332}$ 114
- $82 \overline{)9549}$ 116R37
- $19 \overline{)19076}$ 1004
- $18 \overline{)36576}$ 2032
- $31 \overline{)33449}$ 1079

Solve.

- If the dividend is 1139 and the divisor is 68, what is the quotient? 16R51
- Patrick and his two friends sold their old toys and books. They made \$57. How much would Patrick get if they shared the money equally? \$19
- Nine airplanes filled to capacity carried 1350 passengers to Toronto. All planes were the same size. How many passengers were there per plane? 150
- A survey was to be made of the customers at the farmers' market. Six teenagers were hired to interview 2250 customers. About how many people must each teenager interview? 375

Post-test

Unit

Find the quotient.

- $39 \div 6 =$ 6R3
- $57 \div 9 =$ 6R3
- $53 \div 7 =$ 7R4
- $24 \div 5 =$ 4R4
- $55 \div 3 =$ 18R1
- $18 \div 2 =$ 9
- $165 \div 7 =$ 23R4
- $602 \div 8 =$ 75R2
- $137 \div 2 =$ 68R5
- $624 \div 9 =$ 69R3
- $7319 \div 6 =$ 1219R5
- $1324 \div 4 =$ 331
- $3 \overline{)1842}$ 614
- $7 \overline{)6475}$ 925
- $5 \overline{)31520}$ 6304
- $60 \overline{)272}$ 4R32
- $80 \overline{)159}$ 1R79
- $30 \overline{)247}$ 8R7
- $32 \overline{)217}$ 6R25
- $69 \overline{)345}$ 5
- $18 \overline{)117}$ 6R9
- $47 \overline{)1081}$ 23
- $91 \overline{)6623}$ 72R71
- $25 \overline{)2450}$ 98
- $33 \overline{)4516}$ 136R28
- $47 \overline{)6931}$ 147R22
- $82 \overline{)10250}$ 125

Find the product.

- | | | | |
|---|---|---|---|
| 1. $\begin{array}{r} 213 \\ \times 3 \\ \hline 639 \end{array}$ | 2. $\begin{array}{r} 237 \\ \times 4 \\ \hline 948 \end{array}$ | 3. $\begin{array}{r} 609 \\ \times 8 \\ \hline 4872 \end{array}$ | 4. $\begin{array}{r} 2171 \\ \times 6 \\ \hline 13026 \end{array}$ |
| 5. $\begin{array}{r} 34 \\ \times 13 \\ \hline 442 \end{array}$ | 6. $\begin{array}{r} 17 \\ \times 25 \\ \hline 425 \end{array}$ | 7. $\begin{array}{r} 39 \\ \times 81 \\ \hline 3159 \end{array}$ | 8. $\begin{array}{r} 146 \\ \times 25 \\ \hline 3650 \end{array}$ |
| 9. $\begin{array}{r} 298 \\ \times 152 \\ \hline 45296 \end{array}$ | 10. $\begin{array}{r} 605 \\ \times 556 \\ \hline 336380 \end{array}$ | 11. $\begin{array}{r} 891 \\ \times 317 \\ \hline 282447 \end{array}$ | 12. $\begin{array}{r} 899 \\ \times 485 \\ \hline 436015 \end{array}$ |
| 13. $\begin{array}{r} 275 \\ \times 800 \\ \hline 220000 \end{array}$ | 14. $\begin{array}{r} 973 \\ \times 260 \\ \hline 252980 \end{array}$ | 15. $\begin{array}{r} 594 \\ \times 306 \\ \hline 181764 \end{array}$ | 16. $\begin{array}{r} 208 \\ \times 905 \\ \hline 188240 \end{array}$ |

Calculate.

17. 6^2 36 18. 10^3 1000 19. 2^4 16 20. 8^1 8
 21. 2^5 32 22. 3^2 9 23. 5^3 125 24. 10^4 10 000
 25. $1000 = 10^3$ 3 26. $200 = 2 \times 10^2$ 2 27. $80\,000 = 8 \times 10^4$ 8

Multiply.

- | | | | |
|---|--|--|---|
| 28. $\begin{array}{r} 8\text{¢} \\ \times 3 \\ \hline 24\text{¢} \end{array}$ | 29. $\begin{array}{r} \$0.16 \\ \times 8 \\ \hline \$1.28 \end{array}$ | 30. $\begin{array}{r} \$1.07 \\ \times 32 \\ \hline \$34.24 \end{array}$ | 31. $\begin{array}{r} \$3.95 \\ \times 78 \\ \hline \$308.10 \end{array}$ |
| 32. $\begin{array}{r} 5.6 \\ \times 2 \\ \hline 11.2 \end{array}$ | 33. $\begin{array}{r} 22 \\ \times 3.5 \\ \hline 77.0 \end{array}$ | 34. $\begin{array}{r} 25.3 \\ \times 641 \\ \hline 1037.3 \end{array}$ | 35. $\begin{array}{r} 384 \\ \times 20.9 \\ \hline 8025.6 \end{array}$ |
| 36. $\begin{array}{r} 3.45 \\ \times 4 \\ \hline 13.80 \end{array}$ | 37. $\begin{array}{r} 83 \\ \times 0.49 \\ \hline 40.67 \end{array}$ | 38. $\begin{array}{r} 4.05 \\ \times 256 \\ \hline 1036.80 \end{array}$ | 39. $\begin{array}{r} 154 \\ \times 9.08 \\ \hline 1398.32 \end{array}$ |

Estimate the product.

40. 709×58 42 000 41. 87×3.2 270 42. $\$6.25 \times 75$ \$450

28. $12 \overline{)12134}$ 1011 R2 29. $25 \overline{)46175}$ 1847 30. $84 \overline{)95004}$ 1131

olve.

1. If the divisor is 89 and the quotient is 6572, what is the dividend?
 584 908
2. If the quotient is 42 and the dividend is 3990, what is the divisor?
 95
3. Mr. Townsend earns \$44 600 per year. What does he earn per month?
 \$3716.67
4. Mr. Pirelli bought 900 m of fencing. With this he plans to enclose his rectangular yard that measures 22 m wide and 25 m long. He also plans to enclose his friend's rectangular yard that measures 19 m wide and 18 m long. Does he have enough for both yards?
 Yes. He needs 168 m.

UNIT 5

Measurement

Theme: Energy

Lesson	Objective		Pages
Preview		Review metric prefixes and length units.	97
1	M4	Determine the appropriate units for measuring length.	98-99
2	M5	Find the perimeter of a figure.	100-101
3	M6	Determine the appropriate units for measuring area.	102-103
4	M7	Find the area of a rectangle and of a triangle.	104-105
5	M8	Find the circumference and the area of a circle.	106-107
6	M9	Find the volume of a rectangular prism.	108-109
7	M10	Determine the appropriate units for measuring mass.	110-111
8	M11	Determine the appropriate units for measuring capacity.	112-113
9	M12	Learn how volume, capacity, and mass are related by the measurement of water.	114-115
10	M13	Use the twenty-four hour clock.	116-117
Test		Measurement	118
Review		Division	119

About This Unit

The aim of this unit is to

1. provide experiences in the measurement of length, mass, capacity, and time.
2. review the appropriate units to use for each kind of measurement.
3. develop skill in estimating measurement.
4. develop skill in using measurement formulas.

Measurement is a process of comparing two things that have a common attribute. For example, the chalkboard ledge and a pencil have length as a common attribute. Hence, we can compare the length of the pencil with the length of the chalkboard and conclude that the ledge is 23 pencils long. Through similar comparing activities, the students conclude that there is a need for standard units so that there can be agreement in measuring. The metric system provides the standard units for measuring that are needed.

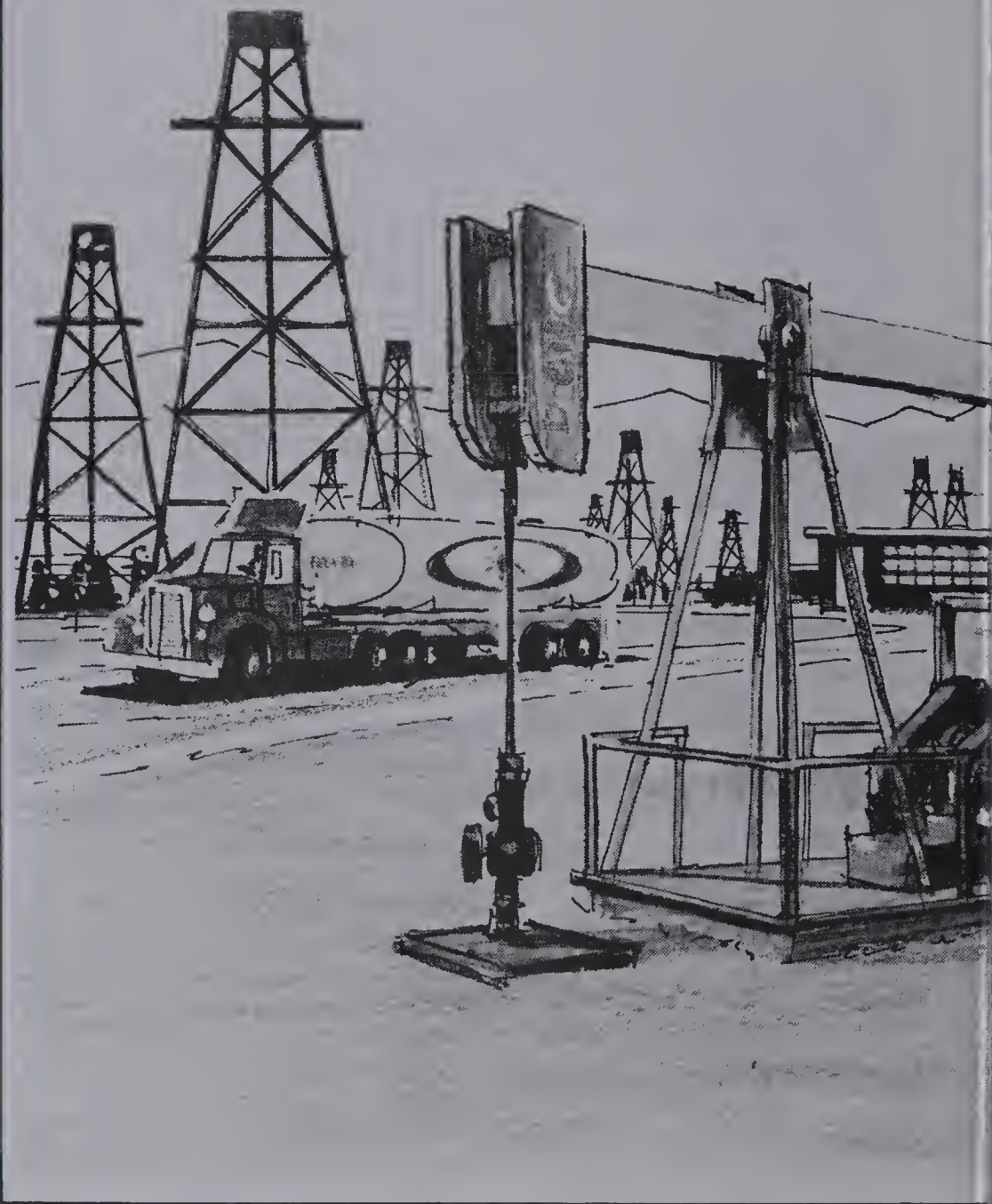
The study of the metric system for measurement in this chapter is an *active* experience. Each lesson has the student actively involved in the measurement process. Since measurement is so closely related to real-life situations, the work of the unit becomes very meaningful and enjoyable.

Ideas

1. Besides having the common metric measuring instruments available (centimetre rulers, metre sticks and tapes, masses and balance scales, graduated cylinders, cubes, etc.) the kitchen cupboard is a rich source of manipulative aids. Cans, jars, and boxes of food items are ideal illustrations of metric measurement. Metric food scales and measuring cups are also invaluable.
2. A classroom measurement centre is best for centralizing measurement activities and is handy for students who show special interest or who need help with the process.
3. Since the larger metric units (kilometre, square kilometre, hectare, kilolitre, tonne, etc.) are difficult to picture in a textbook or classroom, try to provide experiences that will help the students visualize these units. Taking the class outdoors can help this situation greatly.

UNIT 5

MEASUREMENT



Unit 5 Objective	Test Questions	Pages
M4	1-4	98-99
M5	8-11	100-101
M6	5-7	102-103
M7	8-11	104-105
M8	12-19	106-107
M9	20-21	108-109
M10	22-24	110-111
M11	25-27	112-113
M12	28	114-115
M13	29-30	116-117

Pretest

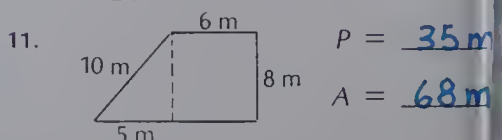
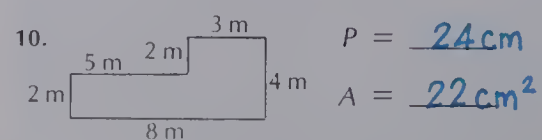
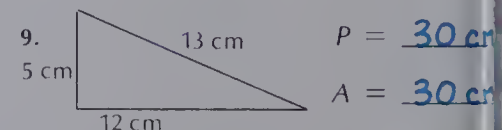
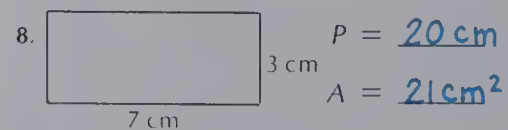
Write the most appropriate unit of length.

- distance across Canada km
- amount of rainfall mm
- distance above sea level m
- length of a nail cm

Copy and complete

- $10\,000\text{ m}^2 = \underline{1}\text{ ha}$
- The area of a book cover is about 430 cm^2
- The area of Quebec is about $1\,500\,000\text{ km}^2$

What is the perimeter and the area of each figure?



Metric Symbols

Prefix	Symbol	Meaning
kilo	k	1000
hecto	h	100
deca	da	10
deci	d	0.1
centi	c	0.01
milli	m	0.001

Length Unit	Symbol
kilometre	km
hectometre	hm
decametre	dam
metre	m
decimetre	dm
centimetre	cm
millimetre	mm

Copy and complete.

Check that your answers are reasonable.

1. $1\text{ m} = \blacksquare\text{ cm}$ 100
2. $1\text{ m} = \blacksquare\text{ mm}$ 1000
3. $1\text{ m} = \blacksquare\text{ dm}$ 10
4. $1\text{ km} = \blacksquare\text{ m}$ 1000
5. $1\text{ km} = \blacksquare\text{ cm}$ 100 000
6. $1\text{ km} = \blacksquare\text{ mm}$ 1 000 000
7. $10\text{ mm} = \blacksquare\text{ cm}$ 1
8. $20\text{ mm} = \blacksquare\text{ cm}$ 2
9. $50\text{ mm} = \blacksquare\text{ cm}$ 5
10. $1\text{ cm} = \blacksquare\text{ mm}$ 10
11. $4\text{ cm} = \blacksquare\text{ mm}$ 40
12. $1\text{ mm} = \blacksquare\text{ cm}$ 0.1
13. $100\text{ cm} = \blacksquare\text{ m}$ 1
14. $200\text{ cm} = \blacksquare\text{ m}$ 2
15. $600\text{ cm} = \blacksquare\text{ m}$ 6
16. $1000\text{ m} = \blacksquare\text{ km}$ 1
17. $3000\text{ m} = \blacksquare\text{ km}$ 3
18. $4000\text{ m} = \blacksquare\text{ km}$ 4
19. $1\text{ m} = \blacksquare\text{ km}$ 0.001
20. $5\text{ m} = \blacksquare\text{ km}$ 0.005
21. $500\text{ m} = \blacksquare\text{ km}$ 0.5

Add.

22. $1\text{ m} + 10\text{ cm} = \blacksquare\text{ cm}$ 110
23. $1\text{ km} + 5\text{ m} = \blacksquare\text{ m}$ 1005
24. $2\text{ m} + 500\text{ cm} = \blacksquare\text{ m}$ 7
25. $5\text{ m} + 60\text{ cm} + 3\text{ mm} = \blacksquare\text{ mm}$ 5063
26. $0.5\text{ km} + 6\text{ m} + 20\text{ cm} = \blacksquare\text{ cm}$ 50620



97

Calculate the circumference of a circle with each diameter.

1. 2 cm , $C = \blacksquare$ 6.28 cm
13. 12 km , $C = \blacksquare$ 37.68 km
14. 20 m , $C = \blacksquare$ 62.80 m
15. 15 mm , $C = \blacksquare$ 47.10 mm

Calculate the area of a circle with each radius.

3. 3 cm , $A = \blacksquare$ 28.26 cm²
17. 4 km , $A = \blacksquare$ 50.24 km²
18. 6 cm , $A = \blacksquare$ 113.04 cm²
19. 50 m , $A = \blacksquare$ 7850.00 m²

Calculate the volume of the box.

- $L = 5\text{ cm}$, $W = 3\text{ cm}$, $H = 6\text{ cm}$, $V = \blacksquare$ 90 cm³
- $L = 4\text{ m}$, $W = 2\text{ m}$, $H = 3\text{ m}$, $V = \blacksquare$ 24 m³

Copy and complete.

- 1 kg = 1000 g
23. $6\text{ kg} = \blacksquare\text{ g}$ 6000
24. $5\text{ t} = \blacksquare\text{ kg}$ 5000
- 2 L = 2000 mL
26. $6000\text{ mL} = \blacksquare\text{ L}$ 6
27. $3\text{ kL} = \blacksquare\text{ L}$ 3000

The mass of 2 cm^3 of water is 2 g.

How long?

- from 07:30 to 10:45 3 h 15 min
30. from 03:40 to 06:05 2 h 25 min

UNIT 5

PREVIEW

Suggestions

Write the word *energy* on the chalkboard. Ask the students, "What comes to your mind when you see or hear the word *energy*?" "What does *energy crisis* mean?" Ask students to name types of *energy sources* (coal, oil, electricity, solar, wind, nuclear power). List the types on the board.

Refer to the picture on page 96. Discuss different uses of measurement in the oil industry.

About the Page

Read and discuss the metric prefixes shown in the chart at the top of page 97. Have the students identify other words that have these prefixes and see if they have a similar meaning. For example:

deca (means 10) — A *decathlon* is an athletic contest consisting of 10 track and field events.

centi (means 0.01) — A *centime* is a monetary unit equal to 0.01 of a French franc.

Write a chart of the metric units of length on the chalkboard. Show the students how to use the chart as they write equivalent metric units.

a. $2\text{ m} = ?\text{ dm} = ?\text{ cm} = ?\text{ mm}$

km	hm	dam	m	dm	cm	mm
			2	20	200	2000

See if the students notice the zero patterns as the metric units are changed.

b. $5\text{ km} = ?\text{ m} = ?\text{ cm} = ?\text{ mm}$

km	hm	dam	m	dm	cm	mm
5			5000		500 000	

Practise several other examples until the students can readily name equivalent metric units.

UNIT 5 LESSON 1

Objective M4

Determine the appropriate units for measuring length.

Introducing the Lesson

Ask several students to use their hand widths to measure the height of the light switch from the floor. Record each student's answer on the board. Ask, "Which one is correct?" Discuss why all the students did not get the same answer. Lead the students to conclude that there is a need for standard units.

Teaching the Lesson

Discuss the references for the most commonly used metric units of length illustrated at the top of page 98. Separate the students into small groups; give them centimetre rulers and metre sticks, and ask them to check these references. Have the students suggest other familiar objects that can be used as references.

Discuss the time it would take (in minutes) for several individual students to walk to school. Using the reference that a kilometre is about an eight minute walk, have the students estimate the distances travelled to school in kilometres.

Give each group several lengths of string. Number each length. Ask the students to estimate and then measure each length. Estimations and measurements should be recorded on a chart. Include lengths that do not measure to an even number. Encourage the students to write their measurements in as many different metric units as they can.

	Estimate	Measure
String No. 1	14 cm	14.3 cm, or 143 mm, or 0.143 m
String No. 2	1.2 m	1.2 m, or 120 cm, or 1200 mm

Appropriate Length Units

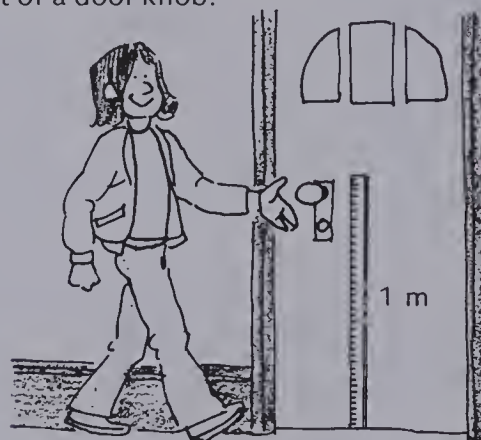
A **millimetre** is about the thickness of a thumbnail.



A **centimetre** is about the width of a finger.



A **metre** is about the height of a door knob.



A **kilometre** is about an eight minute walk.



EXERCISES

Write the symbol for the most appropriate unit to measure each.

- length of an arm **cm**
- width of a stamp **mm**
- football field **m**
- distance between towns **km**
- length of a pencil **cm**
- width of nickel **mm**
- thickness of a dime **mm**
- length of a city block **m**
- length of a river **km**
- width of a river **m**
- height of a pole **m**
- thickness of a string **mm**

Using the Exercises

- Do questions 1 to 12 together. Ask one student to say the metric unit and another student to write the symbol on the chalkboard.

PRACTICE

Match with the most appropriate length.

- height of a tall building **c**
- thickness of a book cover **h**
- distance across Canada **g**
- length of a car **j**
- height of a telephone pole **f**
- height of one-litre oil can **b**
- thickness of a credit card **e**
- height of a kitchen stove **a**
- distance across a small city **a**
- height of a gas pump **i**

- 5 km
- 15 cm
- 150 m
- 1 m
- 1 mm
- 10 m
- 5000 km
- 2 mm
- 1.5 m
- 4 m

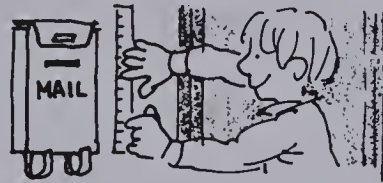
Estimate in centimetres. Check each estimate by measuring.

- width of your foot
- width of your fist
- length of your thumb
- length of your pen
- length of this book
- width of this book

Estimation

1 cm

Estimate each length. Check by measuring.



4 cm

2.

2 cm

3.

3 cm

11 cm

6.

2 cm

1 cm

5 cm

0.5 cm

99

Extra Practice

Worksheet M4

Pages 98-99

Estimate and measure.

	estimate	measure
length of an unsharpened pencil		
thickness of your math book cover		
height of your classroom door		
width of the chalkboard		
thickness of a metre stick		

How long is this path? **81.8 cm** **818 mm** **0.818 m**

153 mm

135 mm

138 mm

109 mm

158 mm

113 mm

Assigning the Practice

Minimum: 1-16

Average: 1-16

Enriched: 1-16

Reinforcement

1. Assign *Estimation* at the bottom of page 99. Some students may wish to express their measurements in two (or even three) different metric units. The length or width of the square in question 5 needs to be estimated and then measured.

2. Ask the students to estimate and measure their own hands in the following ways. Their findings should be recorded in a chart. Encourage the students to write their measurements in as many different metric units as they can.

	Estimate	Measure
a. length of hand span		
b. length of index finger		
c. spread of thumb and index finger		
d. width of palm		
e. length of hand		

Enrichment

1. Ask the students to find the following metric equivalents.

- 32.5 cm = ____ m
- 86.4 m = ____ cm
- 9.2 km = ____ m
- 5.4 km = ____ mm
- 7916 mm = ____ cm
- 19.5 cm = ____ m

2. The decametre and decimetre are units of length that are not often used. Have the students list objects that could be measured in these units. Using 1 dam lengths of string and 10 dm lengths of string, have the students measure the objects listed in either decametres or decimetres.

UNIT 5 LESSON 2

Objective M5

Find the perimeter of a figure.

Introducing the Lesson

Have the students use a dictionary to find the meaning of the following words: periscope, periphery, periphrase, and perimeter. Discuss the meaning of the prefix **peri-**.

Point out that a clue to the meaning of perimeter is found in the word itself **peRIMeter**. It is a measure of the rim or the distance around something.

Teaching the Lesson

Read and discuss the top of page 100. Stress the method for finding the perimeter. Point out that the lengths of the sides of a figure must be measured in the same unit before the perimeter can be found.

Have the students work with a partner. Provide each pair of students with a collection of cardboard polygons and a centimetre ruler. Ask the students to estimate, measure, and record the perimeter for each polygon. Their results should be placed in a chart.

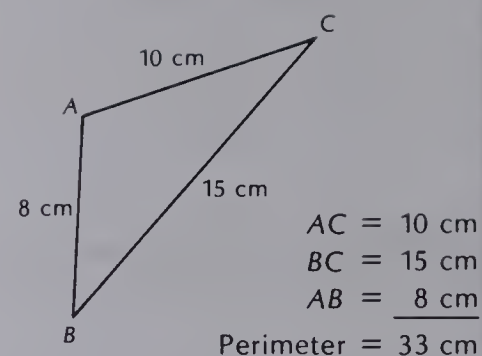
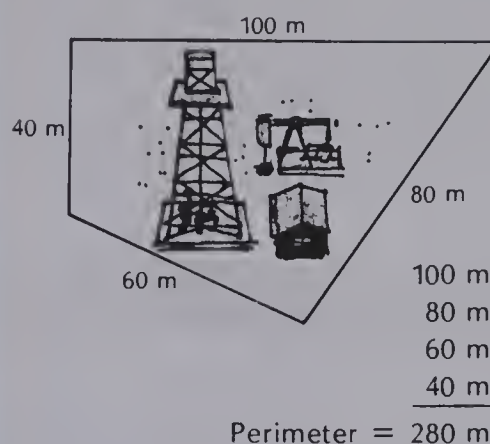
Polygon	Estimate	Measure

Discuss the procedure the students followed as they determined the perimeter of a square and of a rectangle. Was it necessary to measure all sides?

Ask the students to find the perimeter of a polygon with these sides: 26.2 m, 951 cm, 13 m. Have them find the perimeter first in metres and then in centimetres. Stress that all sides must be measured in the same unit before they are added.

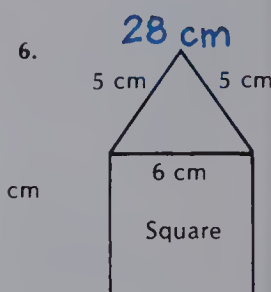
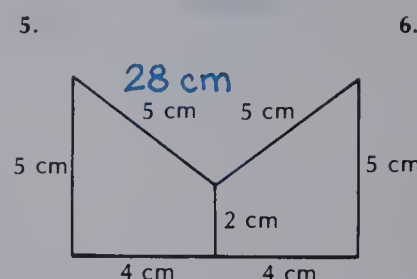
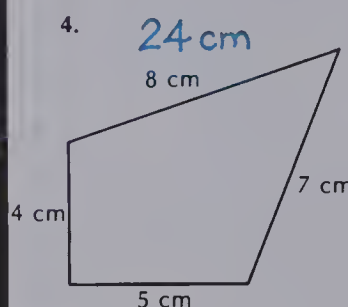
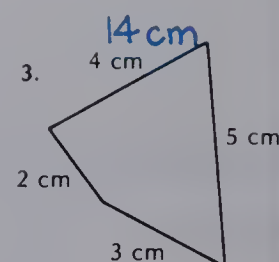
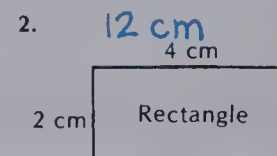
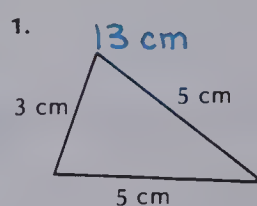
Perimeter

The **perimeter** of a polygon is the sum of the lengths of its sides.



EXERCISES

What is the perimeter?



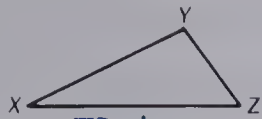
100

Using the Exercises

- Students should have little difficulty with questions 1 to 4. In questions 5 and 6 they should be careful to take only the measures of the segments on an outside edge of the figure.

PRACTICE

Find the perimeter of triangle XYZ.



1. $YZ = 6 \text{ cm}$
 $XZ = 5 \text{ cm}$
 $XY = 3 \text{ cm}$

14 cm

2. $YZ = 31 \text{ km}$
 $XZ = 27 \text{ km}$
 $XY = 17 \text{ km}$

75 km

3. $YZ = 11 \text{ m}$
 $XZ = 9 \text{ m}$
 $XY = 5 \text{ m}$

25 m

4. $YZ = 60 \text{ mm}$
 $XZ = 48 \text{ mm}$
 $XY = 31 \text{ mm}$

139 mm

5. $YZ = 1.6 \text{ m}$
 $XZ = 1.1 \text{ m}$
 $XY = 0.8 \text{ m}$

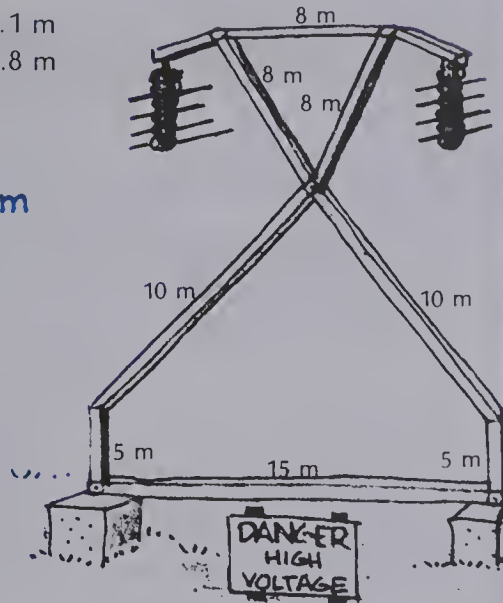
3.5 m

What is the perimeter of a polygon with these sides?

6. 4 cm, 6 cm, 3 cm, 1 cm **14 cm**
 7. 4.5 m, 3.4 m, 5.6 m **13.5 m**
 8. 3 m, 2 m, 75 cm **575 cm**
 9. 4 cm, 9 mm, 4 cm **89 mm**

Solve.

10. What is the perimeter of the triangle at the top of the structure? **24 m**
 11. What is the perimeter of the pentagon at the bottom of the structure? **45 m**

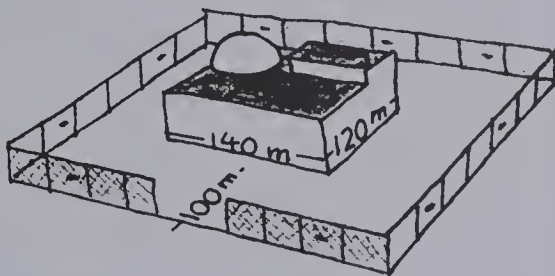


Fenced In

A nuclear power plant measures 20 m by 140 m.

The fence around it is 100 m from the outside walls.

How long is the fence? **1320 m**



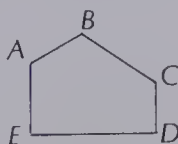
101

Extra Practice

ve.

What is the perimeter of the figure on the right, if the sides have these lengths?

- a. $AB = 4 \text{ cm}$, $BC = 6 \text{ cm}$, $CD = 4 \text{ cm}$, $DE = 9 \text{ cm}$, $EA = 5 \text{ cm}$ Perimeter = **28 cm**



- b. $AB = 4.2 \text{ m}$, $BC = 6.3 \text{ m}$, $CD = 4.0 \text{ m}$, $DE = 9.7 \text{ m}$, $EA = 9.3 \text{ m}$ Perimeter = **33.5 m**

What is the perimeter of a figure, if its sides have these lengths?

- a. 46 cm, 1.6 m, 98.2 cm **304.2 cm**
 b. 8 km, 3 km, 1467 m, 2.7 km **15.167 km**
 c. 30 mm, 2.5 cm, 80 mm, 6.4 cm **199 mm**

The lot around an oil pump is square and is 25 m on each side. How many metres of fence are needed to fence it in? **100 m**

Worksheet M5

Pages 100-101

Assigning the Practice

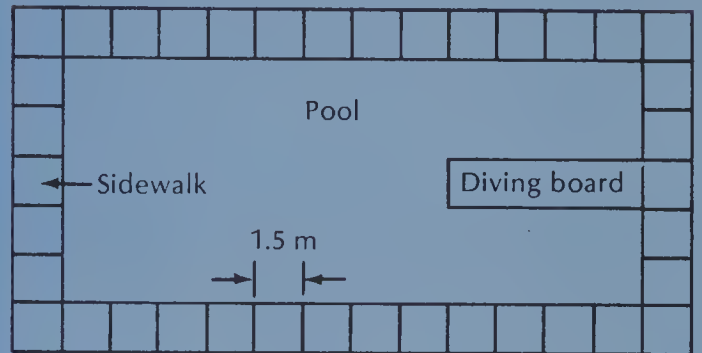
Minimum: 1-7, 10-11

Average: 1-11

Enriched: 1-11

Reinforcement

1. Display the following drawing of a swimming pool and ask the students to find the perimeter of:
- the swimming pool
 - one square of sidewalk
 - the outside of the sidewalk
 - the diving board



2. Ask the students to find the perimeters of these squares.

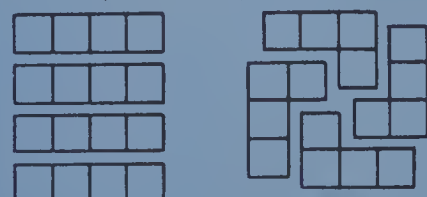
Length of one side	Perimeter
8.6 cm	
47.2 m	
16.9 cm	

Ask the students to find the perimeters of these rectangles.

Length	Width	Perimeter
8.7 cm	5 cm	
12 m	146 cm	
8.2 cm	112 cm	

Enrichment

1. Assign *Fenced In* at the bottom of page 101.
2. Provide centimetre grid paper and a ruler and ask the students to draw as many squares and/or rectangles as they can having a perimeter of 48 cm.
3. Ask the students to trace a 4 by 4 square on centimetre grid paper. Have them separate the grid into four identical parts so that each part has a perimeter of 10 cm. (More than one answer is possible.)



Objective M6

Determine the appropriate units for measuring area.

Introducing the Lesson

Place a rectangular region on an overhead projector. Cover the region with stars, then with circular stickers, and finally with squares. Let the students discover that squares most efficiently cover the rectangular region. Point out that area is a measure of covering and that it is measured in squares. Talk about surfaces that are covered in some way and require an area measure (floors, walls, fields, etc.).

Teaching the Lesson

Carefully read and discuss each of the four units for measuring area pictured on page 102: *square centimetres*, *square metres*, *hectares*, and *square kilometres*.

Show a paper square centimetre. Ask a student to measure each side. By reviewing previous work with exponents in Unit 3, explain that this square is $1\text{ cm} \times 1\text{ cm}$ and has an area of 1 cm^2 .

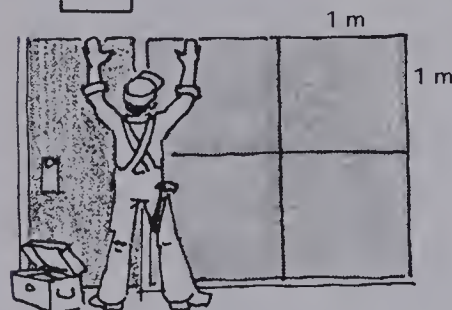
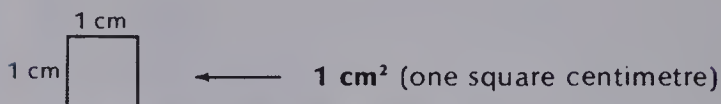
Provide a large sheet of paper. Using a metre stick, have a student draw a square metre. Point out how this square is $1\text{ m} \times 1\text{ m}$ and has an area of 1 m^2 . Place the paper square centimetre in an upper corner. Ask the students to determine how many square centimetres would fit in 1 m^2 . Let them discover that there would be 100 cm along each side and $100\text{ cm} \times 100\text{ cm}$ gives $10\,000\text{ cm}^2$ or 1 m^2 .

Take the students outdoors. Bring along the paper centimetre and metre square, metre sticks, and/or tape measures. Lay the paper metre square on the ground. Have the students measure off 100 m in one direction and then 100 m at right angles from the first line to illustrate the size of one hectare. Ask how many square metres would fit in a hectare. Let the students discover that there would be 100 m along each side and $100\text{ m} \times 100\text{ m}$ gives $10\,000\text{ m}^2$ or 1 ha.

Area

The **area** of a figure is the measure of the surface it covers.

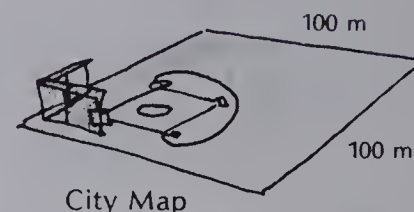
Area can be measured in **square metres (m^2)** or in **square centimetres (cm^2)**.



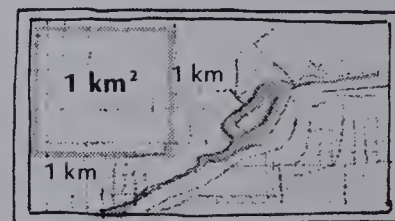
Large areas, like fields, are measured in **hectares (ha)**.

$$1\text{ ha} = 10\,000\text{ m}^2$$

Each insulation panel is **1 m^2** (one square metre).



City Map



Very large areas, like whole cities or countries, are measured in **square kilometres (km^2)**.

EXERCISES

Write the most appropriate unit for measuring each area.

1. a sheet of writing paper cm^2
2. classroom floor m^2
3. surface of a tennis court m^2
4. a pizza cm^2
5. Canada km^2
6. a bookshelf cm^2
7. hockey rink m^2
8. a field ha
9. city park ha
10. the Great Lakes km^2

Using the Exercises

- Ask the students to do questions 1 to 10 individually, then discuss their answers in class. Ask the students for other suggestions of small and large surfaces and have the class decide which unit is most appropriate for measuring the areas.

PRACTICE

Copy and complete each sentence using the most appropriate unit for the area

1. A page in this math book is about 600 cm^2
2. A baseball park is about 1 ha
3. A football field is about 6000 m^2
4. Prince Edward Island is about 5600 km^2
5. A city park is about 10 ha
6. A postage stamp is about 5 cm^2
7. Canada is about 10 000 000 km^2
8. A large pizza is about 1200 cm^2
9. A basketball court is about 600 m^2
10. A credit card is about 50 cm^2
11. A hockey rink is about 1600 m^2
12. Quebec is about 1 500 000 km^2



Copy and complete using $<$, $>$, or $=$.

13. $1 \text{ ha} < 1 \text{ km}^2$
14. $1 \text{ km}^2 > 10 \text{ ha}$
15. $100 \text{ cm}^2 < 1 \text{ m}^2$
16. $1 \text{ m}^2 > 1000 \text{ cm}^2$
17. $2 \text{ ha} > 10 000 \text{ cm}^2$
18. $1 \text{ m}^2 = 10 000 \text{ cm}^2$
19. $1 \text{ ha} = 10 000 \text{ m}^2$
20. $1 \text{ km}^2 > 1000 \text{ ha}$
21. $1 \text{ km}^2 = 100 \text{ ha}$

Provincial Areas

1. List the provinces in order by area from smallest to largest.
b, c, d, a, g, h, i, j, f, e
2. What is the total area of the Prairie Provinces?
1 196 317 km^2
3. What is the total area of the Maritime Provinces?
With Nfld., 539 101 km^2
4. About how much larger is Quebec than Prince Edward Island?
1 535 023 km^2

Province	Area (km^2)
Newfoundland	404 517
Prince Edward Island	5 657
Nova Scotia	55 491
New Brunswick	73 436
Quebec	1 540 680
Ontario	1 068 582
Manitoba	650 087
Saskatchewan	651 900
Alberta	661 185
British Columbia	948 596

103

Assigning the Practice

Minimum: 1-12

Average: 1-12

Enriched: 7-21

Reinforcement

1. Assign *Provincial Areas* at the bottom of page 103.
2. Ask the students to glue or tape pieces of paper together to make a piece of 1 m^2 . Have them mark each side in centimetres and draw a centimetre grid to illustrate how many square centimetres equal one square metre.

Enrichment

1. With centimetre grid paper, have the students make a square decimetre. Ask them to use it as they complete the following statements.

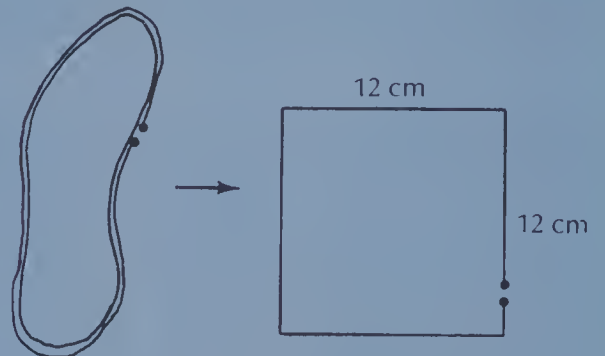
$$1 \text{ dm}^2 = \text{ } \text{cm}^2$$

$$1 \text{ dm}^2 = \text{ } \text{mm}^2$$

$$1 \text{ m}^2 = \text{ } \text{dm}^2$$

2. Have the students check Tyler's conclusion to this problem.

Tyler measures the perimeter of his foot print with a piece of string. He then forms a 12 cm by 12 cm square with the string. He concludes that his foot has a perimeter of $12 \text{ cm} + 12 \text{ cm} + 12 \text{ cm} + 12 \text{ cm}$ or 48 cm. He concludes also that his foot has an area of $12 \text{ cm} \times 12 \text{ cm}$ or 144 cm^2 . Is he right?



$$P = 48 \text{ cm}$$

$$A = 144 \text{ cm}^2$$

Extra Practice

Write cm^2 , m^2 , ha , or km^2

- The area of the top of a school desk is about 2000 cm^2
- The area of a potato field is about 20 ha
- The area of the first floor of a house is about 75 m^2
- The area of Lake Winnipeg is about 24 300 km^2
- The area of a king-size bed is about 4 m^2
- The area of a door is about 2 m^2
- The area of a T.V. screen is about 1500 cm^2
- The area of a small town is about 80 km^2
- The area of a swimming pool is about 1000 m^2
- The area of the front page of a newspaper is about 2200 cm^2

Worksheet M6

Pages 102-103

UNIT 5 LESSON 4

Objective M7

Find the area of a rectangle and of a triangle.

Introducing the Lesson

Give each student a piece of centimetre square paper and a ruler. Have them determine areas of rectangular and triangular regions by *counting squares*. Ask them to draw the following squares and triangles and find the areas in square centimetres.

squares: 2 cm by 2 cm, 3 cm by 3 cm, 4 cm by 4 cm

triangles: Redraw the same three squares and form triangles by drawing diagonals across the squares.

Let the students discover the relationship between the area of each triangle and square.



$$A = 4 \text{ cm}^2$$



$$A = 2 \text{ cm}^2$$

Teaching the Lesson

Read and discuss the top of page 104. Help the students visualize that the area of the shaded triangular region on the right is *half* of the area of the shaded rectangular region on the left. Point out that the terms *length* and *width* are used when speaking about rectangles but that *base* and *height* are used when speaking about triangles. Explain that it is not always convenient to count squares to find area and that formulas state the computations needed. Note the two formulas: $A = L \times W$ and $\frac{B \times H}{2}$. Stress that areas of triangular regions are half rectangular regions or *base times height* divided by 2.

Ask the students to draw several other pairs of rectangles (One rectangle is to be divided in half with a diagonal to form two triangles.) Have them compute the areas of the rectangle and triangle for each pair, using the formulas, and record the results in a chart.

Area Formulas



By counting squares:

$$\text{Area} = 12 \text{ cm}^2$$

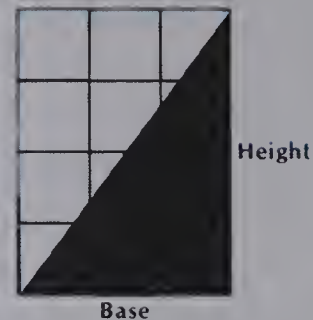
There are 4 rows of 3 squares.

$$4 \times 3 = 12$$

For any rectangle:

$$\text{Area} = \text{Length} \times \text{Width}$$

$$\text{or } A = L \times W$$



The area of the triangle is half the area of the rectangle.

$$\text{Area} = \frac{12}{2} \text{ cm}^2 = 6 \text{ cm}^2$$

For any triangle:

$$\text{Area} = \frac{\text{Base} \times \text{Height}}{2}$$

$$\text{or } A = \frac{B \times H}{2}$$

EXERCISES

What is the area of a rectangle with the following measurements?

1. Length = 5 cm

2. $L = 28 \text{ cm}$

3. $L = 20 \text{ m}$

Width = 4 cm

$W = 30 \text{ cm}$

$W = 15 \text{ m}$

$$20 \text{ cm}^2$$

$$840 \text{ cm}^2$$

$$300 \text{ m}^2$$

What is the area of a triangle with the following measurements?

4. Base = 5 cm

5. $B = 15 \text{ cm}$

6. $B = 36 \text{ m}$

Height = 4 cm

$H = 10 \text{ cm}$

$H = 12 \text{ m}$

$$10 \text{ cm}^2$$

$$75 \text{ cm}^2$$

$$216 \text{ m}^2$$

7. $B = 24 \text{ km}$

8. $B = 16 \text{ m}$

9. $B = 25 \text{ cm}$

$H = 18 \text{ km}$

$H = 20 \text{ m}$

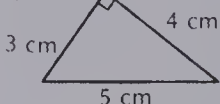
$H = 30 \text{ cm}$

$$216 \text{ km}^2$$

$$160 \text{ m}^2$$

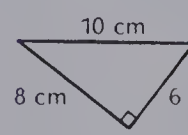
$$375 \text{ cm}^2$$

10.



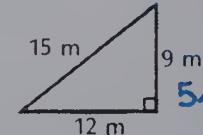
$$6 \text{ cm}^2$$

11.



$$24 \text{ cm}^2$$

12.



$$54 \text{ m}^2$$

104

Using the Exercises

- Questions 1 to 3 provide practice in finding the area of rectangles. Ask the students to write the formula $A = L \times W$ at the start of each problem and then to rewrite it, substituting the known numerals for the letters.

$$A = L \times W$$

$$A = 5 \times 4$$

$$A = 20 \text{ cm}^2$$

- Follow a similar procedure for finding the area of triangles in questions 4 to 9.

$$A = \frac{B \times H}{2}$$

$$A = \frac{5 \times 4}{2}$$

$$A = 10 \text{ cm}^2$$

- The students must determine the base and height of the triangle questions 10 to 12 before they use the formula to find their areas

PRACTICE

What is the area of rectangle ABCD?

1. $DC = 8 \text{ cm}$

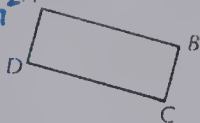
$BC = 20 \text{ cm}$

160 cm^2

2. $BC = 8 \text{ m}$

$DC = 55 \text{ m}$

$AB = 55 \text{ m}$



What is the area of triangle EFG?

3. $EG = 8 \text{ cm}$

$FG = 6 \text{ cm}$

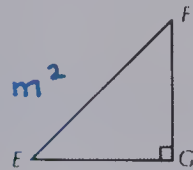
$EF = 10 \text{ cm}$

24 cm^2

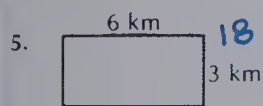
4. $EG = 15 \text{ m}$

$FG = 10 \text{ m}$

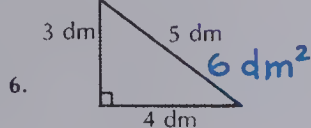
75 m^2



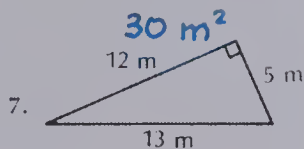
Calculate each area.



18 km^2



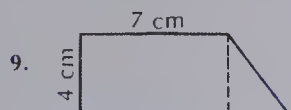
6 dm^2



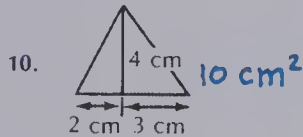
30 m^2



28 m^2



34 cm^2



10 cm^2

11. a. What is the area of triangle STV?

4 cm^2

b. What is the area of triangle TVR?

2 cm^2

c. What is their total area?

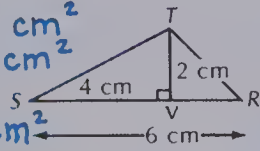
6 cm^2

d. What is the area of triangle STR?

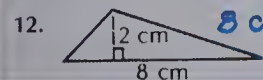
6 cm^2

e. Is there another way to find the area of triangle STR? Yes

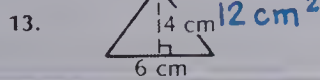
$\frac{6 \times 2}{2}$



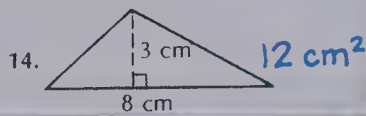
Calculate each area.



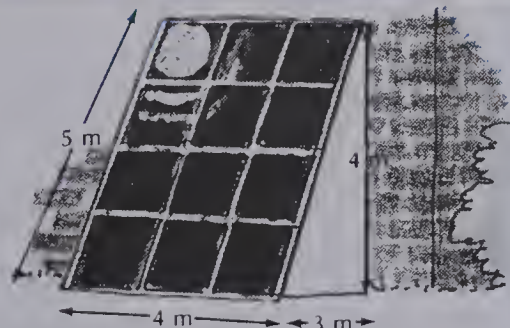
8 cm^2



12 cm^2



12 cm^2



105

Solar Panels

- What is the total area of the solar panel? 20 m^2
- What is the area of the triangular support for the panel? 6 m^2

Extra Practice

Worksheet M7

Pages 104-105

What is the area of a rectangle with the following measurements?

1. $L = 8 \text{ cm}, W = 3 \text{ cm}, A = 24 \text{ cm}^2$

2. $L = 80 \text{ m}, W = 30 \text{ m}, A = 2400 \text{ m}^2$

3. $L = 10 \text{ m}, W = 10 \text{ m}, A = 100 \text{ m}^2$

4. $L = 15 \text{ mm}, W = 12 \text{ mm}, A = 180 \text{ mm}^2$

5. $L = 8 \text{ km}, W = 4 \text{ km}, A = 32 \text{ km}^2$

6. $L = 200 \text{ m}, W = 182 \text{ m}, A = 36400 \text{ m}^2$

What is the area of a triangle with the following measurements?

7. $B = 5 \text{ cm}, H = 4 \text{ cm}, A = 10 \text{ cm}^2$

8. $B = 9 \text{ m}, H = 10 \text{ m}, A = 45 \text{ m}^2$

9. $B = 8 \text{ cm}, H = 20 \text{ cm}, A = 80 \text{ cm}^2$

10. $B = 15 \text{ mm}, H = 8 \text{ mm}, A = 60 \text{ mm}^2$

11. $B = 5 \text{ km}, H = 12 \text{ km}, A = 30 \text{ km}^2$

12. $B = 6 \text{ m}, H = 25 \text{ m}, A = 75 \text{ m}^2$

olve.

What is the area of a rectangle which measures 10 cm by 12 cm? 120 cm^2

1500 cm^2

What is the area of a triangle with a base of 50 cm and a height of 60 cm?

Assigning the Practice

Minimum: 1-10

Average: 1-14

Enriched: 1-14

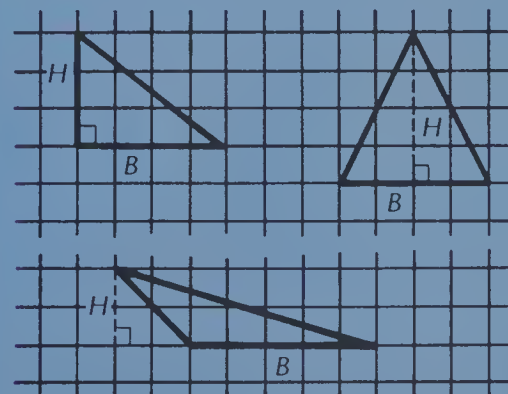
Reinforcement

1. Assign Solar Panels at the bottom of page 105.

2. Prepare a worksheet of several triangles. Place some of them on a grid. Have the students identify the base and height of each triangle. (Time permitting, the students can also measure and compute the areas for each triangle.)

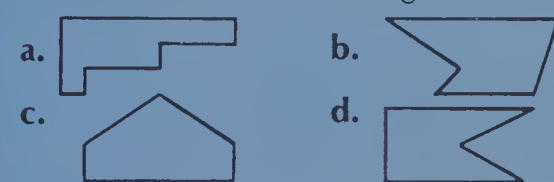
3. Give the students practice in measuring, computing, and recording areas of large triangular and rectangular regions, such as the classroom floor, the chalkboard, large triangles drawn on the chalkboard, etc. Let the students determine the appropriate unit of measure.

4. Show the following three triangles on an overhead projector. Explain how the height is always at right angles to the base and can be in three different positions in relation to the base.



Enrichment

1. Ask the students to measure and find the areas of these figures.



2. On centimetre grid paper, have the students draw:

- as many different rectangles as possible with a perimeter of 40 cm, and compare their areas.
- as many different rectangles as possible with an area of 72 cm², and compare their perimeters.

UNIT 5 LESSON 5

Objective M8

Find the circumference and the area of a circle.

Introducing the Lesson

Give to each student a sheet of circles drawn on grid paper, and string.

Review the terms related to circles:

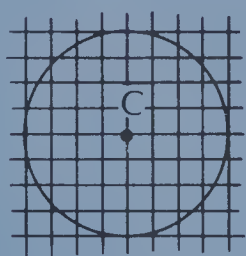
“Point to the **radius** of circle A.”

“How long is the **diameter** of circle B?”

Point out that the students will measure the dimensions of a circle as they did for rectangles. They will measure the perimeter of the circle, which is called the **circumference**, and the **area** of a circle, which is the region inside a circle.

Teaching the Lesson

Have the students find the diameter of circle C on their sheet.



diameter = 8 cm

Ask them to cut an 8 cm piece of string, lay it on the circumference of the circle, and find how many times it will fit around the rim of the circle. Since it fits about 3 times, they now have a rough estimate of the circumference, diameter \times 3 or $8 \times 3 = 24$ cm. Do the same for several other circles. Let the students see that the diameter always fits about 3 times around the circumference. Point out that the more exact way for finding the circumference is similar.

$$\begin{array}{lcl} \text{diameter} \times 3.14 \text{ (or Pi)} & = & \text{circumference} \\ 8 \times 3.14 & = & 25.12 \text{ cm} \end{array}$$

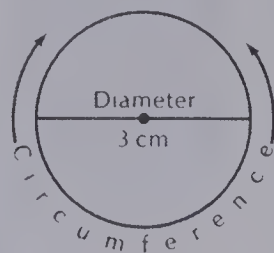
Have the students find the circumference of each figure on the sheet. Encourage them to estimate first (diameter \times 3).

Ask the students to estimate the areas (by counting squares) of all of the circles on their sheet. Then have them calculate the area of each using the area formula.

Summarize the lesson with a discussion of the information at the top of page 106.

Measuring Circles

The **circumference** is the distance around a circle.

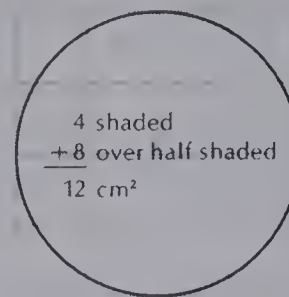


$$\begin{array}{l} \text{Circumference} = \text{Diameter} \times 3.14 \\ = 3 \times 3.14 \\ = 9.42 \end{array}$$

The circumference is 9.42 cm.

3.14 is the approximate value of a special number called **pi**.

The **area** of a circle can be estimated by counting squares



$$\begin{array}{l} \text{Area} = (\text{Radius})^2 \times 3.14 \\ = 2 \times 2 \times 3.14 \\ = 12.56 \end{array}$$

The area is 12.56 cm².

EXERCISES



1. Estimate the area by counting squares. **32 cm**
2. What is the radius? **3 cm**
3. Calculate the area. **28.26 cm²**
4. What is the diameter? **6 cm**
5. Calculate the circumference. **18.84 cm**

Using the Exercises

- Do questions 1 to 5 as a class. Let the students do each question on their own, but after each is completed, check for misunderstandings and, if necessary, explain the procedures. When finding circumferences and areas, ask the students to write the formula first and then to rewrite it substituting the known numerals for the letters. See that the answers are labelled properly.

$$\begin{array}{l} C = D \times 3.14 \\ C = 6 \times 3.14 \\ C = 18.84 \text{ cm} \end{array}$$

$$\begin{array}{l} A = R^2 \times 3.14 \\ A = 3^2 \times 3.14 \\ A = 28.26 \text{ cm}^2 \end{array}$$

PRACTICE

Calculate the circumference of a circle with each diameter.

1. 11 cm 2. 25 cm 3. 22 cm 4. 40 cm 5. 300 cm
6. 12 m 7. 20 mm 8. 35 km 9. 42 dm 10. 63 cm
1. 34.54 cm 2. 78.50 cm 3. 69.08 cm 4. 125.60 cm 5. 942.00 cm
6. 37.68 m 7. 62.80 m 8. 109.9 km 9. 131.88 dm 10. 197.82 cm

Calculate the area of a circle with each radius.

11. 6 cm 12. 7 m 13. 10 m 14. 22 cm 15. 15 cm
16. 12 m 17. 16 m 18. 30 m 19. 5 km 20. 23 cm
11. 113.04 cm² 12. 153.86 m² 13. 314.00 m² 14. 1519.76 cm² 15. 706.5 cm²
16. 452.16 m² 17. 803.84 m² 18. 2826.00 m² 19. 78.50 km² 20. 1661.06 cm²

Solve.

21. What is the area of a circle with a diameter of 10 cm? 78.50 cm²
22. What is the circumference of a circle with a radius of 15 cm? 94.20 cm
23. What is the diameter of a circle with a circumference of 628 cm? 200 cm

REVIEW

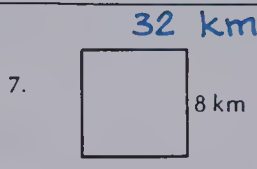
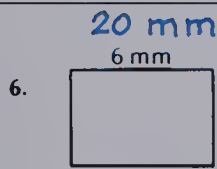
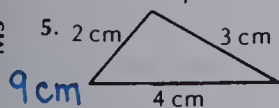
Which unit of length is most appropriate?

M4

1. your height cm
2. height of a mountain m
3. width of a lake m
4. thickness of a book mm

What is the perimeter?

M5



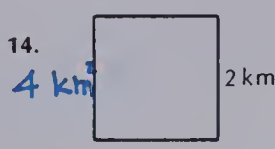
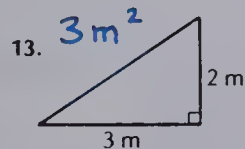
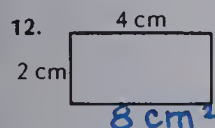
Which unit of area is most appropriate?

M6

8. size of a farm ha
9. floor space at home m²
10. the Maritime Provinces km²
11. your footprint cm²

What is the area?

M7



15. What is the circumference of a circle with a diameter of 2 cm? 6.28 cm
16. What is the area of a circle with a radius of 4 m? 50.24 m²

107

Assigning the Practice

Minimum: even numbers

Average: odd numbers

Enriched: 6-10, 16-23

Review Exercises

Questions	Objective	Pages
1-4	M4	98-99
5-7	M5	100-101
8-11	M6	102-103
12-14	M7	104-105
15, 16	M8	106-107

Reinforcement

1. With compasses and centimetre grid paper, have the students draw six circles having these dimensions:

- a. a radius of 3 cm, of 5 cm, and of 2 cm
- b. a diameter of 8 cm, of 12 cm, and of 14 cm.

2. Have the students measure and record the circumferences and diameters of several round objects (cans, coins, jars, etc.) and record their findings on a chart. Then have them use a calculator to divide the circumference by the diameter. Let the students discover that this result is always a little more than 3 (or pi, 3.14), which is the number of times the diameter fits onto the circumference.

Circumference	Diameter	C ÷ D
59.66 cm	19 cm	3.14
21 cm	6.7 cm	3.1343

Enrichment

1. Ask the students to measure the circumference of several nearby tree trunks and then to calculate the diameter of each trunk.

2. Ask the students to draw a circle having a 16 cm radius with a compass on a piece of cardboard. Have them:

- a. estimate and then calculate the circumference and area of the circle on a calculator. (The circumference will be 1 m.)
- b. nail the cardboard to a stick and use it to measure the length and width of the classroom, hallway, etc.



Extra Practice

Worksheet M8

Pages 106-107

Calculate the circumference of each circle.

1. C = 56.52 cm
2. C = 131.88 m
3. C = 141.30 cm
4. C = 298.30 m

Calculate the area of each circle.

5. A = 530.66 cm²
6. A = 2122.64 m²
7. A = 13266.50 cm²
8. A = 706.50 m²

Solve.

Mr. Hedges wants to put a decorative fence around a circular flower garden. The diameter of the garden is 4 m. How much fencing does he need?

12.56 m

UNIT 5 LESSON 6

Objective M9

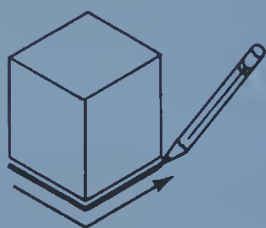
Find the volume of a rectangular prism.

Introducing the Lesson

Show the students a small box and ask them, "How big is this box?" Discuss the many ways to record its size, for example, its *length*, *width*, *height*, amount of *surface*, or the amount of *space* it takes up. Explain that today's lesson will focus on how much space a box occupies, or its **volume**.

Teaching the Lesson

Discuss the lesson example shown on page 108. Give the students some centimetre cubes. Ask each student to point out the length, width, and height of a cube. The cube is 1 cm long by 1 cm wide by 1 cm high or $1\text{ cm} \times 1\text{ cm} \times 1\text{ cm}$. This can be written 1 cm^3 .



Use the centimetre cubes and a rectangular box, into which the cubes will fit, to illustrate the meaning of the volume of the box. Fill in the bottom layer first. Ask a student to count the number of blocks in the bottom layer. Ask another student to count the number of blocks along the length and along the width. Record this on the chalkboard.

Length	Width	Cubes in one layer
8 cm	10 cm	80 cm^3

Fill in the second layer. Ask how many blocks are in the second layer. Develop the idea that volume is the number of blocks on one layer, multiplied by the number of layers.

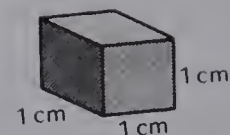
Have the students construct other rectangular solids with centimetre cubes, determine the volume of each, and record their findings in a chart.

Let the students discover that volume can be calculated simply by multiplying the length, the width, and the height: $V = L \times W \times H$.

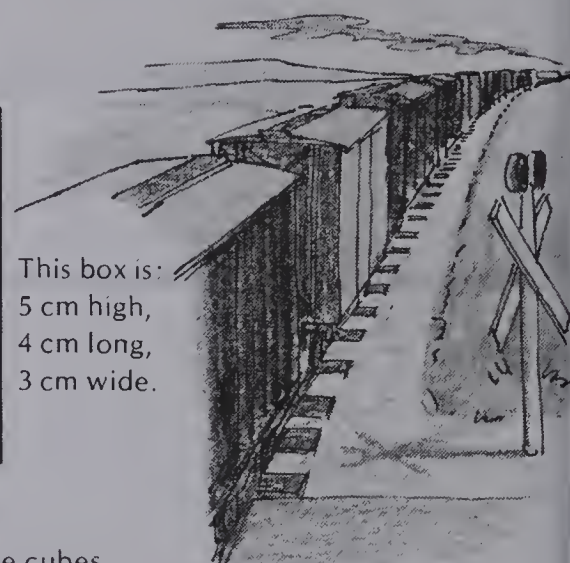
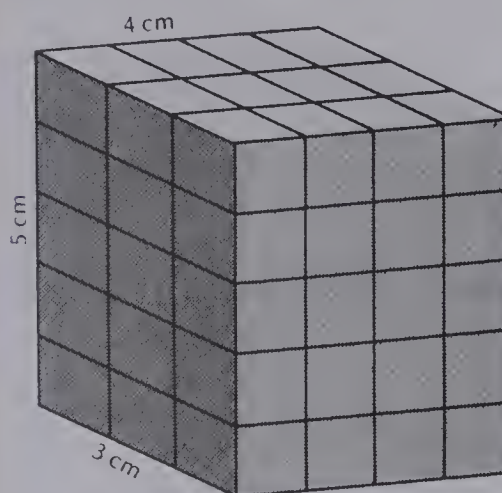
Volume

The **volume** of a solid is the measure of the space it occupies.

The number of cubic centimetres in a box is a measure of its **volume**.



one cubic centimetre
 1 cm^3



The box contains 5 layers.
Each layer has 4×3 or 12 centimetre cubes.
Its volume is $5 \times (4 \times 3) = 5 \times 12 = 60\text{ cm}^3$.

Volume = Length \times Width \times Height
 $V = L \times W \times H$

Volume can also be measured in **cubic decimetres (dm^3)** or in **cubic metres (m^3)**.

EXERCISES

Calculate the volume of each box.

- Length = 5 cm
Width = 4 cm
Height = 2 cm 40 cm^3
- $L = 2\text{ cm}$
 $W = 2\text{ cm}$
 $H = 2\text{ cm}$ 8 cm^3
- $L = 5\text{ m}$
 $W = 3\text{ m}$
 $H = 2\text{ m}$ 30 m^3
- Length = 4 m
Width = 3 m
Height = 5 m 60 m^3
- $L = 5\text{ dm}$
 $W = 2\text{ dm}$
 $H = 4\text{ dm}$ 40 dm^3
- $L = 1\text{ dm}$
 $W = 1\text{ dm}$
 $H = 1\text{ dm}$ 1 dm^3

Using the Exercises

- If students have difficulty with these questions, have them construct rectangular solids with centimetre cubes in the dimension given.
- Ask the students to write the formula first for each question and then to rewrite it substituting the known numerals for the letter. See that the answers are labelled properly.

$$V = L \times W \times H$$

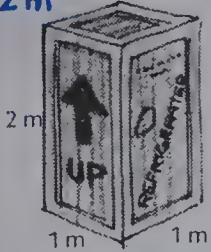
$$V = 5 \times 4 \times 2$$

$$V = 40\text{ cm}^3$$

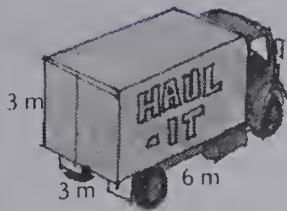
PRACTICE

Calculate the volume.

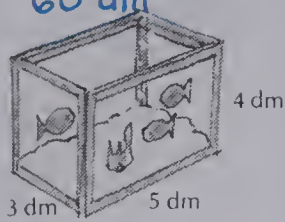
1. 2 m^3



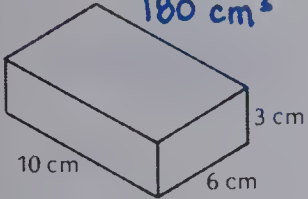
2. 54 m^3



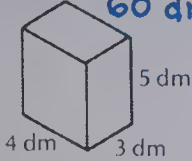
3. 60 dm^3



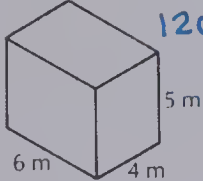
4. 180 cm^3



5. 60 dm^3



6. 120 m^3

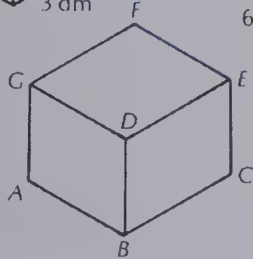


7. $BD = 7 \text{ dm}$ $EC = 7 \text{ dm}$

$AB = 8 \text{ dm}$ $DG = 8 \text{ dm}$

$BC = 9 \text{ dm}$ $DE = 9 \text{ dm}$

504 dm^3 504 dm^3



Solve.

8. How many cubic metres of air are there in a room 7 m wide, 3 m high, and 10 m long? 210 m^3

9. What is the volume of a wood-burning stove that is 1 m long, 40 cm wide, and 5 dm high? 0.2 m^3

Assigning the Practice

Minimum: 1-9

Average: 1-9

Enriched: 1-9

Reinforcement

1. Assign Crow's Nest Pass at the bottom of page 109.

2. With twelve metre sticks and masking tape, have students construct a metre cube. With 12 straws 1 dm long and pipe cleaners, have the students construct a decimetre cube. Ask the students to calculate the following volumes using these cubes.

$1 \text{ dm}^3 = \underline{\hspace{1cm}} \text{ cm}^3$

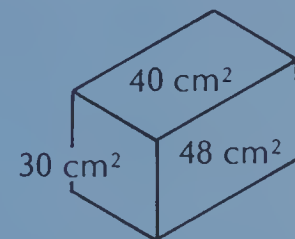
$1 \text{ m}^3 = \underline{\hspace{1cm}} \text{ dm}^3$

$1 \text{ m}^3 = \underline{\hspace{1cm}} \text{ cm}^3$

3. Set out several boxes of various sizes. Have the students find the volume of each, choosing the most appropriate unit of measurement.

Enrichment

1. Give the students this puzzle. One face of a rectangular box has an area of 40 cm^2 , another face has an area of 30 cm^2 , and another has 48 cm^2 . What is the volume of the box?



109

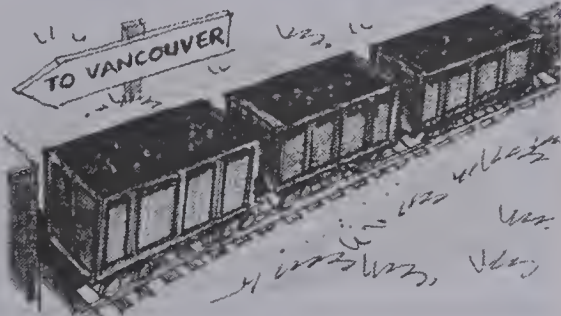
2. Have the students measure their home refrigerators and determine the volume of:

- the freezer
- the vegetable bin
- the non-freezer part
- the entire refrigerator

Crow's Nest Pass

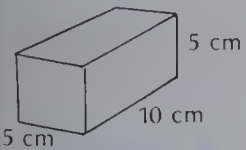
Three coal cars are each 3 m wide and 2 m high. Attached end-to-end, they are 26 m long altogether. There is 1 m between cars. What is the volume of one coal car?

48 m^3



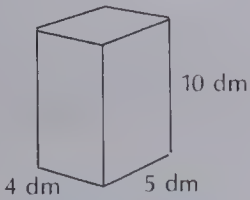
Extra Practice

What is the volume?



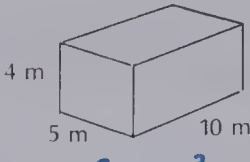
$V = 250 \text{ cm}^3$

2.



$V = 200 \text{ dm}^3$

3.



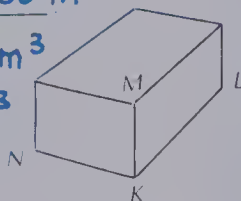
$V = 200 \text{ m}^3$

Length = 20 cm, Width = 10 cm, Height = 5 cm, $V = 1000 \text{ cm}^3$

Length = 30 m, Width = 25 m, Height = 7 m, $V = 5250 \text{ m}^3$

$KL = 12 \text{ cm}$, $NK = 14 \text{ cm}$, $MK = 15 \text{ cm}$, $V = 2520 \text{ cm}^3$

$KL = 4 \text{ dm}$, $NK = 7 \text{ dm}$, $MK = 9 \text{ dm}$, $V = 252 \text{ dm}^3$



Solve

What is the volume of an oil furnace that is 1 m wide, 2 m long, and 1 m high? 2 m^3

Worksheet M9

Pages 108-109

Objective M10

Determine the appropriate units for measuring mass.

Introducing the Lesson

Write the following terms on the chalkboard and ask the students what they have in common: ships, meats, salt, potatoes, coal, wheat, apples, corn flakes. See if the students can answer that all of these items are measured by *mass**. Discuss how small quantities, such as salt and cornflakes, are measured in *grams*; medium quantities, such as meat and potatoes, are measured in *kilograms*; and, large quantities, such as ships and coal, are measured in *tonnes*.

Teaching the Lesson

Read and discuss the examples at the top of page 110. Have available a few objects with a mass of 1 g (small button, raisin, etc.) and 1 kg (dictionary, 1000 raisins, etc.) so that the students can lift, feel, and compare their masses. Stress the relationship of these units of mass to each other.

$$1000 \text{ g} = 1 \text{ kg}$$

$$1000 \text{ kg} = 1 \text{ t}$$

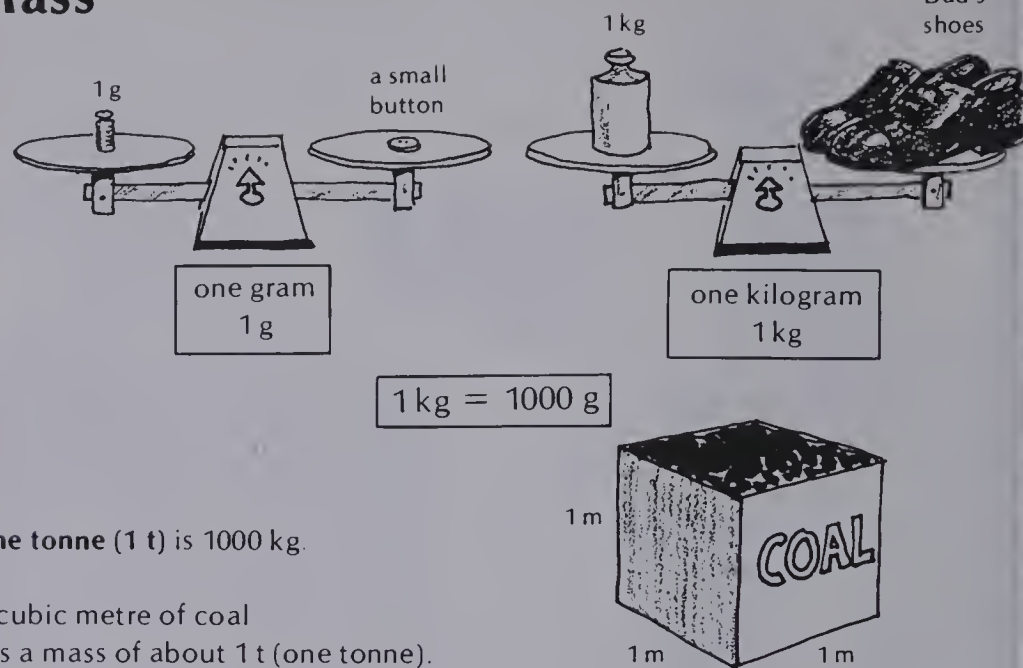
Have the students work in small groups with balance scales and several objects. Ask them to estimate, measure, and record the mass of each object. Provide objects that can be measured in grams and kilograms. Let the students decide on the more appropriate unit. Some students may wish to record their measures in both units.

Object	Estimate	Measure
bag of onions	2 kg	1.5 kg or 1500 g

If possible, measure the mass of each student. See if their combined masses approximate one tonne.

*NOTE: Technically, mass is the amount of matter in an object. Mass never changes. Weight is the force of gravity on an object. Weight varies from location to location.

Mass



EXERCISES

Which unit? Use the symbols g, kg, or t.

Object	Mass	Object	Mass
1. dime	3 ■	7. bike	6 ■
2. hammer	1 ■	8. car	1 ■
3. football player	100 ■	9. elephant	4 ■
4. light bulb	50 ■	10. bag of potatoes	5 ■
5. apple	250 ■	11. fork	40 ■
6. your friend	40 ■	12. truck	4 ■

Copy and complete each equation.

13. 1 kg = ■ g 1000 14. 2 kg = ■ g 2000 15. 3 kg = ■ g 3000

16. 1 t = ■ kg 1000 17. 2 t = ■ kg 2000 18. 3 t = ■ kg 3000

Using the Exercises

- Questions 1 to 12 can be done as a class with discussion.
- Questions 13 to 18 emphasize the relationship between masses. See that the students successfully complete these before proceeding with the practice questions on page 111.

PRACTICE

What is a reasonable mass for each item?

1. bag of flour **a or c** a. 2.0 kg
2. chair **f** b. 2 g
3. truckload of coal **d** c. 4 kg
4. a horse **e** d. 6 t
5. feather **b** e. 0.5 t
- f. 10 kg

Complete.

6. $3 \text{ kg} = \blacksquare \text{ g}$ **3000**
7. $2 \text{ t} = \blacksquare \text{ kg}$ **2000**
8. $2000 \text{ g} = \blacksquare \text{ kg}$ **2**
9. $3000 \text{ kg} = \blacksquare \text{ t}$ **3**
10. $3.5 \text{ kg} = \blacksquare \text{ g}$ **3500**
11. $4.5 \text{ t} = \blacksquare \text{ kg}$ **4500**

Solve.

12. How many 50 kg bags of potatoes are there in a tonne? **20**
13. A brontosaurus has a mass of 39.5 t. A tyrannosaur has a mass of 6.9 t. A brachiosaur has a mass of 75.8 t. Which is heavier: a brontosaurus and 4 tyrannosaurs or a brachiosaur?

Big Heat



One tonne of uranium can produce as much heat as 3 million tonnes of coal.

Canadian mines produce about 6000 t of uranium a year.

1. How much coal would have to be mined to get the same amount of energy? **18 000 million tonnes**
2. About 25 million tonnes of coal is mined in Canada each year. How long would it take to mine the amount of coal in Question 1? **720 years**

111

Extra Practice

Complete. Use g, kg, or t.

- An eraser is about 25 **g**
- A sailboat is about 4.5 **t**
- Five football players are about 0.5 **t**

Complete.

$$5000 \text{ g} = \underline{5} \text{ kg}$$

$$5.6 \text{ kg} = \underline{5600} \text{ g}$$

$$16 \text{ kg} + 250 \text{ g} = \underline{16\,250} \text{ g}$$

$$1 \text{ t} + 875 \text{ g} = \underline{1\,000\,875} \text{ g}$$

$$1 \text{ t} - 685 \text{ kg} = \underline{315} \text{ kg}$$

$$5 \text{ t} - 500 \text{ g} = \underline{4\,999\,500} \text{ g}$$

$$2. \text{ A cat is about } 2 \underline{\text{ kg}}$$

$$4. \text{ A rhinoceros is about } 2.5 \underline{\text{ t}}$$

$$6. \text{ A newborn baby is about } 3.5 \underline{\text{ kg}}$$

$$8. \text{ } 3800 \text{ kg} = \underline{3.8} \text{ t}$$

$$10. \text{ } 5.5 \text{ t} = \underline{5500} \text{ kg}$$

$$12. \text{ } 2 \text{ t} + 955 \text{ kg} = \underline{2\,955} \text{ t}$$

$$14. \text{ } 3 \text{ kg} + 239 \text{ g} = \underline{3\,239} \text{ g}$$

$$16. \text{ } 1 \text{ kg} - 48 \text{ g} = \underline{952} \text{ g}$$

$$18. \text{ } 9 \text{ kg} - 100 \text{ g} = \underline{8\,900} \text{ g}$$

Assigning the Practice

Minimum: 1-11

Average: 1-13

Enriched: 1-13

Reinforcement

1. Ask the students to bring a few containers of food (cans or jars measured in grams or kilograms) to school. Provide scales so they can check their masses.

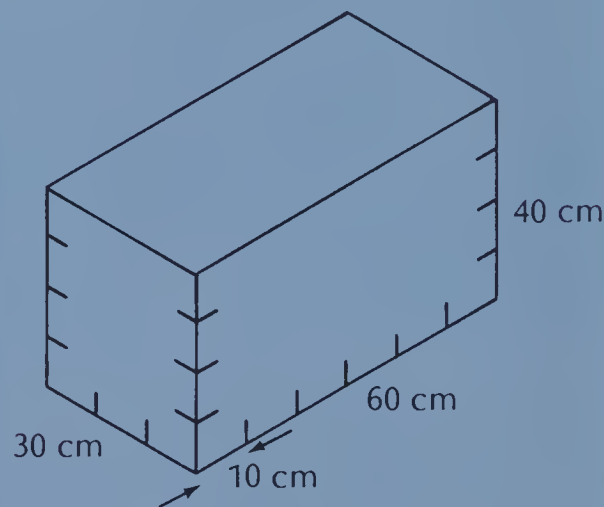
2. Fill ten plastic bags of the same size with various things found outdoors (sand, small pebbles, leaves, grass, large rock, twigs, etc.). Have the students estimate and then measure and record their masses.

Enrichment

1. Assign *Big Heat* at the bottom of page 111.

2. Provide a centicube and a cubic decimetre (filled with water) for the students to measure their masses. Help the students conclude that a cubic centimetre and a cubic decimetre have masses, respectively, of 1 g and 1 kg when filled with water.

Using this information, ask the students to determine the mass of the water in a 30 cm by 60 cm by 40 cm aquarium.



Worksheet M10

Pages 110-111

Objective M11

Determine the appropriate units for measuring capacity.

Introducing the Lesson

Review the measurement of objects by *length* and by *mass*. Ask the students to name objects in each category as you list them on the chalkboard. Show a few containers. Explain that a measure of how much they hold, or of their *capacity*, can be made. Have the students name objects for which capacity could be measured.

Teaching the Lesson

Point out the metric units for measuring capacity with the examples at the top of page 112. Show the students a 1 mL container (a cubic centimetre) and a 1 L container (a cubic decimetre or a milk carton). Illustrate the relationship between *millilitres* and *litres* by asking how many cubic centimetres of water would fill up 1 cubic decimetre. Let the students conclude that $1000 \text{ mL} = 1 \text{ L}$. Point out that *milli-* means one thousandth and that $1 \text{ mL} = 0.001 \text{ L}$. Show a one-litre container filled with 500 mL of water. Ask the students to name the amount of litres ($500 \text{ mL} = 0.5 \text{ L}$).

Tell the students that for measuring the capacity of large containers, such as swimming pools and oil tanks, a larger unit is needed. The unit is the *kilolitre* (kL). Point out the relationship of kilolitres to litres, $1 \text{ kL} = 1000 \text{ L}$. As an example, refer to the oil truck on page 112, which holds 10 000 L or 10 kL.

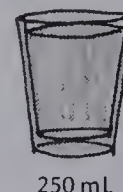
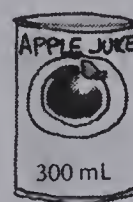
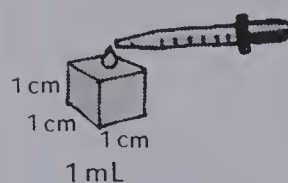
Have the students work in small groups with graduated cylinders and various containers. Ask them to estimate, measure, and record the capacity of each container. Provide containers that can be measured in millilitres and litres. Let the students decide on the more appropriate unit. Some students may wish to record their measures in both units.

Container	Estimate	Measure
a cup	300 mL	250 mL or 0.25 L

Capacity

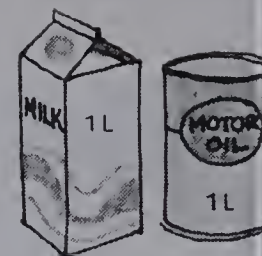
Capacity is the measure of how much an object holds. The **litre (L)** is used to measure liquid **capacity**.

There are **1000 millilitres (mL)** in a litre.



1000 mL = 1 L

1 mL = 0.001 L



Large amounts of liquid can be measured in **kilolitres (kL)**.



1 kL = 1000 L

EXERCISES

Which unit would be most appropriate to measure each capacity: litre, millilitre, or kilolitre?

- jug of lemonade **L**
- medicine in a bottle **mL**
- gas in a car **L**
- city water tower **kL**
- spoonful of gravy **mL**
- a fish bowl **L**
- a swimming pool **kL**
- a pickle barrel **L**

Complete.

- A milkshake is 550 **mL**.
- A tube of toothpaste is 160 **mL**.
- A tank truck of gasoline is 12 **kL**.
- A can of soup is 250 **mL**.
- A milk jug is 4 **L**.

Using the Exercises

- Questions 1 to 13 can be done individually by the students and then discussed and checked.

PRACTICE

Complete. 1000

1. 1 L = 1000 mL 2

2. 1 mL = 0.001 L

3. 0.5 L = 500 mL

4. 2000 mL = 2 L

5. 2500 mL = 2.5 L

6. 100 mL = 0.1 L

7. 1 kL = 1000 L

8. 1 kL = 1000 000 mL

9. 1 L = 0.001 kL

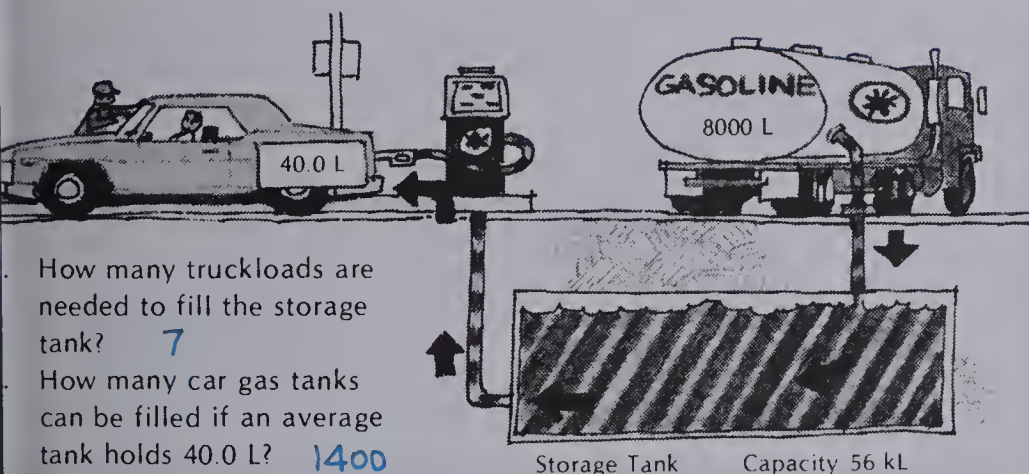
What is a reasonable capacity for each item?

10. a cup of hot chocolate c a. 500 mL
 11. a bucket f b. 1 mL
 12. a bottle of dishwashing liquid a c. 250 mL
 13. a raindrop b d. 250 L
 14. a swimming pool e e. 250 kL
 f. 6 L

Solve.

15. The family car takes 8 L of oil.
 How much would an oil change cost
 if a litre sells for \$1.45? \$11.60
16. Ellen mixes 60 mL of oil with 1 L of
 gasoline for the lawn mower. How much
 oil does she need to mix with 2.5 L of gas? 150 mL

Filling Up



- How many truckloads are
 needed to fill the storage
 tank? 7
- How many car gas tanks
 can be filled if an average
 tank holds 40.0 L? 1400

113

Extra Practice

Worksheet M11

Pages 112-113

Complete. Use mL, L, or kL.

1 cm³ holds about 1 mL of water.

2. 1 dm³ holds about 1 L of water.

1 m³ holds about 1 kL of water.

4. A bathtub holds about 1 kL of water.

Complete.

8000 mL = 8 L

6. 3100 L = 3.1 kL

7.5 kL = 7500 L

8. 4.9 L = 4900 mL

2 mL = 0.002 L

10. 5 L = 0.005 kL

9 L + 600 mL = 9600 mL

12. 1 kL + 800 L = 1.8 kL

e.

Alice made a drink with 300 mL of ginger ale and 250 mL of orange
 juice. How much drink did she have? 550 mL

Assigning the Practice

Minimum: 1-15

Average: 1-16

Enriched: 1-16

Reinforcement

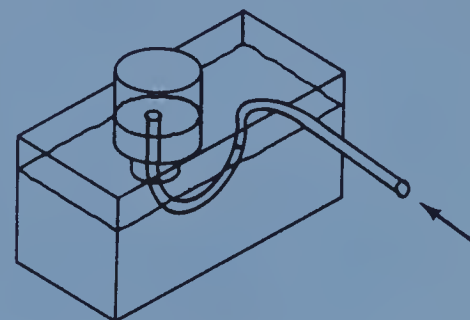
1. Assign *Filling Up* at the bottom of
 page 113.

2. Have the students make the follow-
 ing fruit punch for the class to drink.

- 1.5 L Hawaiian punch
 175 mL frozen orange juice concentrate
 175 mL frozen lemonade concentrate
 175 mL frozen grape juice concentrate
 1.5 L cold water
 875 mL ginger ale
 (30 to 35 servings)

3. Ask the students to make a list of
 things we use in our homes that are
 measured in litres and millilitres. From
 their lists, prepare a list for classroom
 display.

4. If a fish tank is available, students
 can measure their lung capacity.



The student blows into a hose forcing
 water out of the bottle. The displaced
 water can then be measured.

Enrichment

Assign these puzzling questions.

a. You have a 3 L container and a 5 L
 container. How can you measure 2 L of
 water using only these two containers?

b. You have a 3 L container and a 5 L
 container. How can you measure 4 L of
 water using only these two containers?

Objective M12

Learn how volume, capacity, and mass are related by the measurement of water.

Introducing the Lesson

Give each student the bottom half of a 2 L milk carton (which measures about 1 dm × 1 dm × 1 dm) or an open, plastic decimetre cube. Ask them to measure the cube in decimetres to determine its volume.

$$V = L \times W \times H$$

$$V = 1 \text{ dm} \times 1 \text{ dm} \times 1 \text{ dm}$$

$$V = 1 \text{ dm}^3$$

Have the students also determine the volume of the cube in cubic centimetres.

Teaching the Lesson

Tell the students that they are going to fill the cubic decimetre container with water and measure its capacity and mass as shown at the top of page 114.

First have the students pour water into the cubic decimetre container from a graduated cylinder to measure its capacity. Let the students discover that 1 dm³ has a capacity of 1 L. Have the students then decide on how many litres a 0.5 dm³ container, a 2 dm³ container, or a 2.5 dm³ container could hold.

Next have the students find the mass of the empty cubic decimetre containers. Ask them to fill their container with water again and measure its mass (after subtracting the mass of the container from the total mass). Let the students discover that a cubic decimetre container holds 1 L of water, which has a mass of 1 kg. Ask the students to determine the mass of 0.5 L of water, of 2 L of water, and of 2.5 L of water. Summarize their findings in a chart.

Volume of Water	Capacity	Mass
1 dm ³	1 L	1 kg
0.5 dm ³	0.5 L	0.5 kg
2 dm ³	2 L	2 kg

Repeat this procedure with a cubic centimetre of water.

Mass, Capacity, and Volume

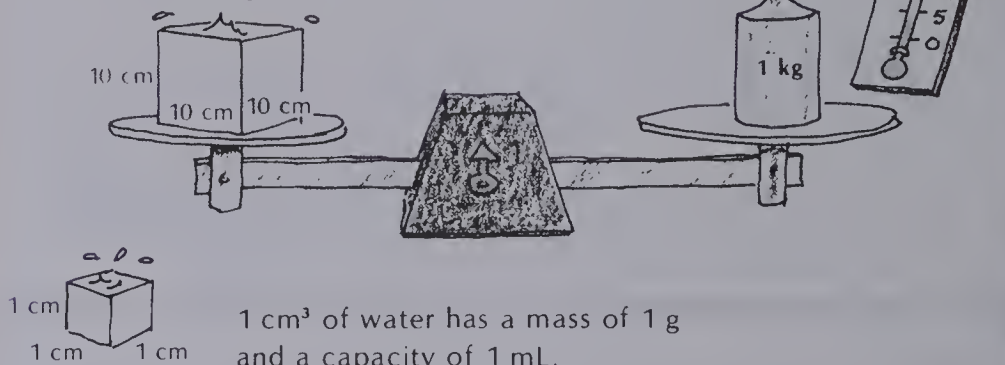
This cube of water at 4°C has very special properties.

It measures 1 dm or 10 cm on each side.

Its **volume** is 1 dm³ or 1000 cm³.

Its **mass** is 1 kg.

Its **capacity** is 1 L.



1 cm³ of water has a mass of 1 g and a capacity of 1 mL.

EXERCISES

Copy and complete the chart.

Volume of Water	Capacity	Mass
1 dm ³	1. ■ L	2. ■ kg
5 dm ³	3. ■ L	4. ■ kg
0.5 dm ³	5. ■ L	6. ■ kg
1 cm ³	7. ■ mL	8. ■ g
1000 cm ³	9. ■ mL	10. ■ g
500 cm ³	11. ■ mL	12. ■ g
500 cm ³	13. ■ L	14. ■ kg

1. 1L 2. 1kg
3. 5L 4. 5kg
5. 0.5L 6. 0.5
7. 1mL 8. 1g
9. 1000mL
10. 1000g
11. 500mL
12. 500g
13. 0.5L
14. 0.5kg

Using the Exercises

- Questions 1 to 6 involve statements related to the fact that 1 dm³ of water, or 1 L of water, has a mass of 1 kg.
- Questions 7 to 12 involve statements related to the fact that 1 cm³ of water, or 1 mL of water, has a mass of 1 g.
- Questions 13 and 14 involve statements related to the fact that 1000 cm³ of water, or 1000 mL of water, has a mass of 1000 g. This can also be stated as 1000 cm³ of water, or 1 L of water, has a mass of 1 kg.

PRACTICE

- Copy and complete the chart for water.

Capacity		Mass		Volume	
L	mL	g	kg	cm ³	dm ³
2	2000	2000	2	2000	2
0.5	500	500	0.5	500	0.5
3	3000	3000	3	3000	3
1.5	1500	1500	1.5	1500	1.5
0.1	100	100	0.1	100	0.1
2.5	2500	2500	2.5	2500	2.5

Solve.

- Which liquid is heaviest?
For what is this liquid often used?
Mercury - barometer, thermometer
- Why does oil float in sea water?
Lighter
- Why do you think sea water is heavier than ordinary water?
Salt solution in sea water

Liquid	Mass of 1 L
Mercury	14 kg
Oil	920 g
Turpentine	870 g
Sea water	1025 g

How Heavy is the Air?

A scientist used a very accurate balance to measure the mass of air.

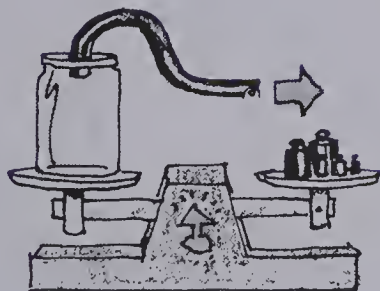
She found that a one-litre jar filled with air had a total mass of 528.675 g.

She then took the air out of the jar with a vacuum pump.

After the air was pumped out, the jar had a mass of 527.382 g.

How heavy is a litre of air?

1.293 g



115

Assigning the Practice

Minimum: 1-4

Average: 1-4

Enriched: 1-4

Reinforcement

- Assign *How Heavy is the Air?* at the bottom of page 115.

- Let the students experiment with measuring the mass of 1 L of syrup, sawdust, sand, etc. Ask them to compare these masses to that of 1 L of water.

- Since a cup (250 mL) and a tablespoon (15 mL) are often used in cooking, ask the students to determine their volumes in cubic centimetres and their mass when filled with water.

Enrichment

Make a cubic metre with 12 metre sticks and tape. Have the students complete the following chart using the cubic metre.

Volume of Water	Capacity	Mass
1 m ³	___ kL	___ t
6 m ³	___ kL	___ t
3.5 m ³	___ kL	___ t
1 m ³	___ L	___ kg
4 m ³	___ L	___ kg
1.5 m ³	___ L	___ kg
1 m ³	___ mL	___ g
2 m ³	___ mL	___ g

Extra Practice

Complete.

A 1000 cm³ container holds 1 **L** of water.

A 1000 cm³ container holds 1000 **g** of water.

1 mL of water will fill a **1** cm³ container.

1 L of water will fill a **1000** cm³ container.

1 L of water has a mass of 1 **kg**.

1 L of water has a mass of 1000 **g**.

10 mL of water has a mass of 10 **g**.

1000 mL of water has a mass of 1000 **g**.

1000 mL of water has a mass of 1 **kg**.

Solve.

A rectangular container measures 10 cm × 10 cm × 5 cm **500 cm³**
What is the volume? How many millilitres will it hold? **500 mL**

Worksheet M12

Pages 114-115

Objective M13

Use the twenty-four hour clock.

Introducing the Lesson

Ask the students to close their eyes. Tell them to raise their hands and open their eyes when they think it is one minute from the time you say, "Start." Use a watch that marks the seconds to keep track of the actual times at which they raise their hands. Note these times on the chalkboard. From this activity, discuss the need for a time-telling instrument.

Point out the various instruments for telling time that have been devised from the past to the present (sundials, pendulum clocks, electric clocks, digital clocks, etc.) Discuss the reasons why accuracy in telling time is important in our lives today.

Teaching the Lesson

Review telling time briefly on a 12 h clock before introducing the 24 h clock illustrated on page 116. Point out that the 24 h clock is used in many countries to more clearly represent official times. Airplane and train timetables use the 24 h clock. Important events of the day and theatre times are noted with the 24 h clock in some countries.

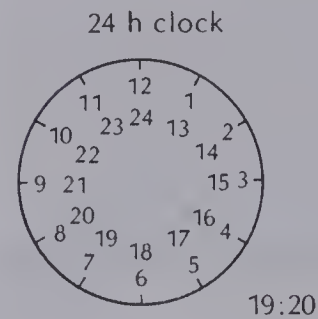
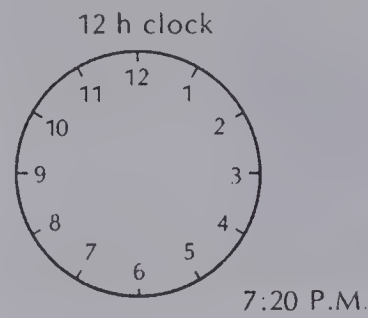
Have the students name the typical activities they would do in a day. List these on the chalkboard. Ask the students then to say the time each of these activities would begin with the 24 h clock. Point out how there is no "A.M." or "P.M." needed when writing times with the 24 h clock.

If possible, reproduce an airline or railroad timetable on an overhead transparency and discuss arrival and departure times using the 24 h clock.

Using either a student's typical activity timetable for one day or an airline timetable, provide practice in telling the amount of time spent between two given times.

Time

The **twenty-four hour clock** is often used for timetables and digital clocks.



12 h clock	24 h clock
1 A.M.	01:00
2 A.M.	02:00
3 A.M.	03:00
•	•
•	•
•	•
10 A.M.	10:00
11 A.M.	11:00
12 Noon	12:00
1 P.M.	13:00
2 P.M.	14:00
3 P.M.	15:00
•	•
•	•
•	•
10 P.M.	22:00
11 P.M.	23:00
12 Midnight	24:00



EXERCISES

Write the time using the 24 h clock.

- | | | |
|----------------------------|---------------------------|---------------------------|
| 1. 4:00 A.M. 04:00 | 2. 5:30 A.M. 05:30 | 3. 1:25 P.M. 13:25 |
| 4. 4:15 P.M. 16:15 | 5. 6:15 P.M. 18:15 | 6. 9:45 P.M. 21:45 |
| 7. 12:30 P.M. 12:30 | 8. Noon 12:00 | 9. Midnight 24:00 |

How long?

- | | |
|---|---|
| 10. from 07:00 to 09:00 2 h | 11. from 07:00 to 12:00 5 h |
| 12. from 07:00 to 12:30 5 h 30 min | 13. from 07:30 to 12:00 4 h 30 min |
| 14. from 07:30 to 13:00 5 h 30 min | 15. from 07:45 to 13:00 5 h 15 min |
| 16. from 12:45 to 19:00 6 h 15 min | 17. from 12:45 to 19:20 6 h 35 min |
| 18. from 09:20 to 16:50 7 h 30 min | 19. from 09:50 to 16:20 6 h 30 min |

116

Using the Exercises

- At first allow the students to use a 24 h clock to answer questions 1 to 9. Then have the students answer the questions again without looking at a clock.
- The students may prefer at first to get the answers to questions 10 to 19 by counting. However, they should also know how to subtract. Remind them that 24 h clock times are not written in the base ten numeration system, and that when regrouping is required, 1 h is regrouped as 60 min.

$$\begin{array}{r}
 \text{hours} \quad \text{minutes} \\
 12 : 60 \\
 - 7 : 45 \\
 \hline
 5 : 15
 \end{array}$$

PRACTICE

Answer the question by using the airline timetable.

- How many flights leave Calgary each day? **12**
- List the flights that leave Calgary in the morning. **201, 836, 188, 176**
- If you lived in Calgary and you wanted to arrive in Vancouver about noon, what flight would you take? **117**
- Use the time zone chart to find how long each flight takes.



H & M Airline Timetable

From Calgary to	Depart	Arrive	Flight
Vancouver	07 00	07 20	201
	12 20	12 40	117
	17 00	17 20	277
Winnipeg	2:48	14 20	188
Chicago	3:50	06 55	836
	3:25	13 05	822
Toronto	4:35	00 30	188
	3:25	12 35	120
Montreal	3:50	11 30	176
	4:00	23 00	111
Halifax	6:00	12 55	154
	6:32	16 30	634

Time	08:00	09:00	10:00	11:00	12:00	12:30
Zone	Pacific	Mountain	Central	Eastern	Atlantic	Newfoundland
Cities	Vancouver	Calgary	Winnipeg Chicago	Toronto Montreal	Halifax	St John's

REVIEW

- M9 Calculate the volume of each box.
- $L = 3 \text{ cm}, W = 4 \text{ cm}, H = 2 \text{ cm}$ **24 cm^3**
 - $L = 5 \text{ m}, W = 3 \text{ m}, H = 2 \text{ m}$ **30 m^3**
- M10 Complete.
- $4 \text{ kg} = \blacksquare \text{ g}$ **4000**
 - $1500 \text{ g} = \blacksquare \text{ kg}$ **1.5**
 - $\blacksquare \text{ t} = 3000 \text{ kg}$ **3**
- M11
- $2 \text{ L} = \blacksquare \text{ mL}$ **2000**
 - $2500 \text{ mL} = \blacksquare \text{ L}$ **2.5**
 - $1 \text{ kL} = \blacksquare \text{ L}$ **1000**
- M12
- What is the mass of 1 L of water? **1000 g**
 - What is the volume of 1 mL of water? **1 cm³**
- M13 How long?
- from 09:15 to 12:10 **2 h 55 min**
 - from 10:50 to 18:35 **7 h 45 min**

117

Assigning the Practice

Minimum: 1-4

Average: 1-4

Enriched: 1-4

Review Exercises

Questions	Objective	Pages
1-2	M9	108-109
3-5	M10	110-111
6-8	M11	112-113
9-10	M12	114-115
11-12	M13	116-117

Reinforcement

- Ask the students to write a timetable of their activities for last weekend using a 24 h clock.
- Mount on cards newspaper clippings of the times films are shown at movie theaters. Ask the students to rewrite these times using the 24 h clock.
- Have the students complete these exercises.

What time is it one and a half hours after:

- 03:20?
- 06:10?
- 19:15?
- 10:20?
- 00:15?
- 23:55?

What time is it 45 min before:

- 07:15?
- 09:25?
- 21:30?
- 00:30?
- 16:40?
- 13:32?

Enrichment

- Have the students research and report on these topics.
 - time zones in Canada and in the world
 - different ways time has been measured
- Encourage the students to bring to school any 24 h timetables they may have at home to share with the class.

Problem Solving Activities

Assign Level 6, Unit 5

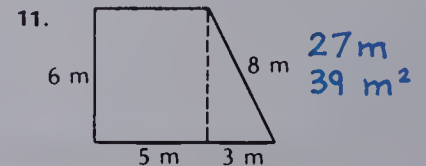
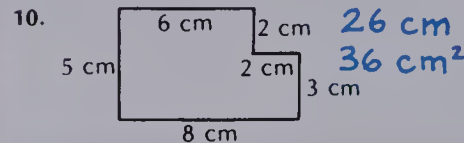
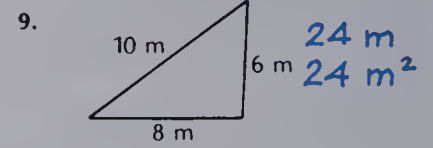
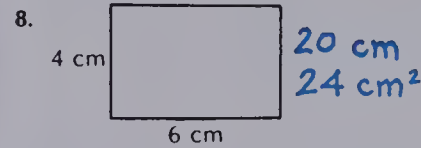
Write the most appropriate unit of length.

- distance around the world **km**
- amount of snowfall **cm**
- height of a mountain **m**
- thickness of paper **mm**

Copy and complete.

- 1 ha = **10 000** m²
- The area of a postage stamp is about 6 **cm²**.
- The area of New Brunswick is about 73 000 **km²**.

What is the perimeter and area of each figure?



Calculate the circumference of a circle with each diameter.

- 3 cm **9.42 cm**
- 10 cm **31.40 cm**
- 25 km **78.50 km**
- 18 m **56.52 m**

Calculate the area of a circle with each radius.

- 2 cm **12.56 cm²**
- 10 cm **314.00 cm²**
- 5 km **78.50 km²**
- 12 mm **452.16 mm²**

Calculate the volume of each box.

- $L = 6$ cm, $W = 3$ cm, $H = 5$ cm **90 cm³**
- $L = 2$ m, $W = 8$ m, $H = 10$ m **160 m³**

Complete. **2000**

- 2 kg = **2000** g
- 4000 kg = **4** t
- 8.5 t = **8500** kg
- 3 L = **3000** mL
- 3500 mL = **3.5** L
- 2000 L = **2** kL
- What is the mass of 2 L of water? **2 kg**

How long? **3 h**

- from 08:25 to 11:25
- from 06:50 to 13:30 **6 h 40 min**

Unit 5 Objective	Test Questions	Pages
M4	1-4	98-99
M5	8-11	100-101
M6	5-7	102-103
M7	8-11	104-105
M8	12-19	106-107
M9	20-21	108-109
M10	22-24	110-111
M11	25-27	112-113
M12	28	114-115
M13	29-30	116-117

Post-test

Unit

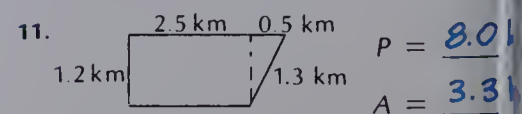
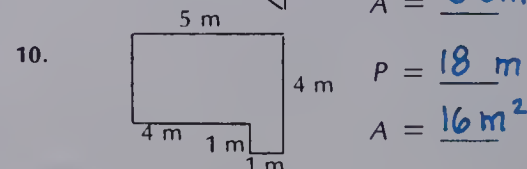
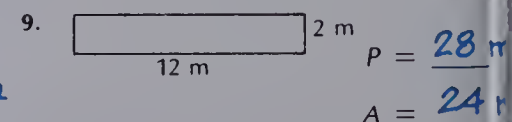
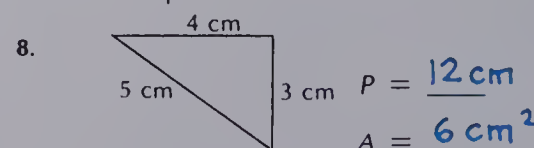
Write the most appropriate unit of length.

- length of the St. Lawrence River **km**
- thickness of a nail **mm**
- height of a house **m**
- diameter of a plate **cm**

Copy and complete.

- 2 ha = **20 000** m²
- The area of a student desk is about 2400 **cm²**.
- The area of Lake Erie is about 25 700 **km²**.

What is the perimeter and the area of each figure?



UNIT 6

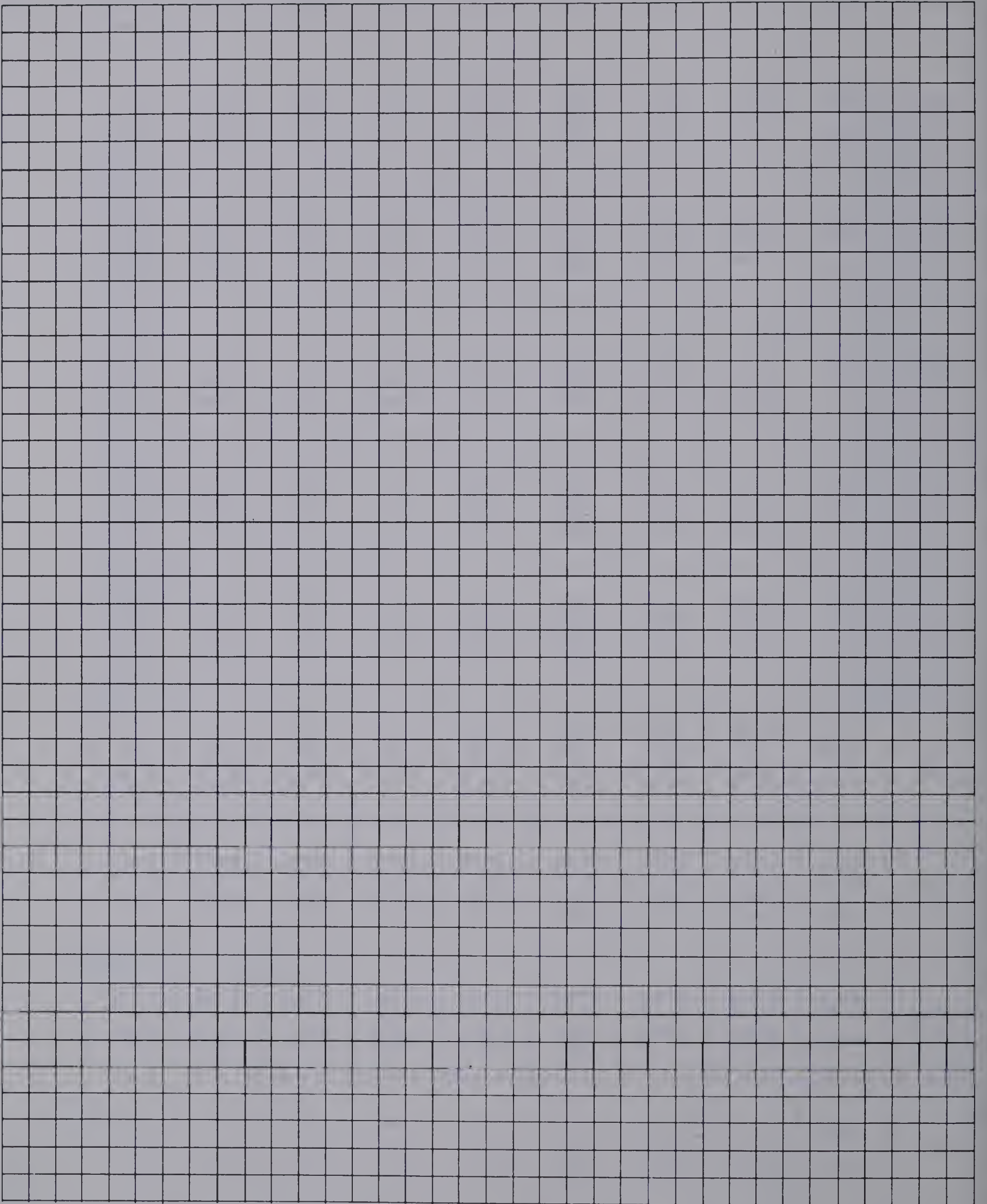
Number Theory

Theme: Books

Lesson	Objective		Pages
Preview		Review multiplication and division of whole numbers.	121
1	A25	Understand the concept of multiples; find the LCM.	122-123
2	A26	Understand the concept of divisibility; know and apply the rules of divisibility by 2, 3, 4, 5, 6, 9, and 10.	124-125
3	A27	Understand the concept of factor; find the GCF.	126-127
4	A28	Understand the concepts of prime number and composite number.	128-129
5	A29	Find the prime factors of a number using a factor tree.	130-131
6	A30	Simplify number expressions by doing multiplication and division before addition and subtraction.	132-133
7	A31	Simplify number expressions by doing the work inside the parentheses first.	134-135
8	A32	Understand how a number machine works; calculate the output value, given the rule.	136-137
9	A33	Solve simple equations.	138-139
10	PS5	Write an equation for a word problem.	140-141
Test		Number Theory	142
Review		Measurement	143

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

5 mm grid



About This Unit

The aim of this unit is to have the students apply a variety of math skills, operations, concepts, and principles to problem solving. It is important to realize that there are two types of application for mathematics. The first and obvious type is the application of skills and concepts to solving real-life problems. This type includes buying and selling, measuring, building, and many more situations. The second type is the application of skills and concepts to another area of mathematics. It is this type of application that this unit on number theory studies. For example, the concepts of factor, divisibility, and GCF are useful when multiplying, dividing, and reducing fractions. The concepts of multiple and LCM are useful when adding and subtracting fractions. An understanding of prime and composite numbers is useful when factoring numbers. Simplifying number expressions, solving simple equations, and writing equations for word problems lead to more complex work in algebra. Since Unit 6 covers all of these topics, the students must understand the concepts presented to ensure success in future work in mathematics.

Ideas

The addition and multiplication tables may be used as an effective vehicle for discussing number theory patterns.

+	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10	11
3	3	4	5	6	7	8	9	10	11	12
4	4	5	6	7	8	9	10	11	12	13
5	5	6	7	8	9	10	11	12	13	14
6	6	7	8	9	10	11	12	13	14	15
7	7	8	9	10	11	12	13	14	15	16
8	8	9	10	11	12	13	14	15	16	17
9	9	10	11	12	13	14	15	16	17	18

×	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

Have the students observe the following types of patterns:

- a. Compare the first row with the first column, second row with the second column, etc.
- b. Compare the diagonal rows.
- c. Are the tables symmetrical on either side of the diagonals?
- d. What patterns of odds and evens do you see?
- e. Are there rows or columns that are the same in both tables?
- f. Take any rectangle on the multiplication table and multiply the opposite corner numbers. Are the products always the same?

2	4	6	8
3	6	9	12

$2 \times 12 = 24$
 $3 \times 8 = 24$

- g. Take any rectangle on the addition table and add the opposite corner numbers. Are the sums always the same?

7	8
8	9
9	10

$7 + 10 = 17$
 $9 + 8 = 17$

UNIT 6

NUMBER THEORY



Unit 6 Objective	Test Questions	Pages
A25	1-3	122-123
A26	4-13	124-125
A27	14-16	126-127
A28	17-21	128-129
A29	22-26	130-131
A30	27-28	132-133
A31	29-30	134-135
A32	34-36	136-137
A33	31-33	138-139

Pretest

Unit 6

List multiples for each. Find the LCM.

1. 3 and 4 ^{3: 3, 6, 9, 12, 15,} 2. 6 and 9 ^{6: 6, 12, 18, 24} 3. 8 and 12 ^{8: 8, 16, 24}
^{4: 4, 8, 12, 16} ^{9: 9, 18, 27} ^{12: 12, 24, 36}

Is 324 divisible by:

4. 5? No 5. 2? Yes 6. 3? Yes 7. 4? Yes 8. 6? Yes

Is 1108 divisible by:

9. 2? Yes 10. 3? No 11. 9? No 12. 5? No 13. 6? No

List the factors of each. Find the GCF.

14. 12 and 16 ^{12: 1, 2, 3, 4, 6, 12} ^{16: 1, 2, 4, 8, 16} 15. 15 and 25 ^{15: 1, 3, 5, 15} ^{25: 1, 5, 25} 16. 36 and 48 ^{36: 1, 2, 3, 4, 6, 9, 12} ^{48: 1, 2, 3, 4, 6, 8, 12}
^{16, 24, 48}

Write prime or composite

17. 9 Composite 18. 11 Prime 19. 17 Prime
 20. 21 Composite 21. 67 Prime

Decode a Book

Find the value for the letter for each equation.
Decode the message below.

1. $8 \times 69 = \boxed{A}$

3. $238 \div \boxed{C} = 7$

5. $4 \times 110 = \boxed{E}$

7. $6 \times 78 = \boxed{T}$

9. $3 \times 154 = \boxed{Y}$

11. $78 \times \boxed{O} = 312$

13. $3608 \div \boxed{L} = 41$

15. $1242 \div \boxed{B} = 23$

17. $34 \times 78 = \boxed{V}$

19. $1816 \div 8 = \boxed{U}$

21. $6 \times 389 = \boxed{R}$

23. $300 \div 25 = \boxed{K}$

25. $35 \times \boxed{O} = 140$

2. $17 \times \boxed{S} = 765$

4. $3942 \div 9 = \boxed{N}$

6. $6 \times 77 = \boxed{Y}$

8. $13 \times \boxed{O} = 52$

10. $8 \times 55 = \boxed{E}$

12. $4 \times 138 = \boxed{A}$

14. $204 \div \boxed{C} = 6$

16. $12 \times 39 = \boxed{T}$

18. $9 \times 52 = \boxed{T}$

20. $93 \times \boxed{O} = 372$

22. $2376 \div \boxed{L} = 27$

24. $2754 \div 51 = \boxed{B}$

26. $18 \times \boxed{I} = 738$

Y O U C A N T

462 4 227 34 552 438 468

T E L L A

468 440 88 88 552

B O O K B Y

54 4 4 12 54 462

I T S C O V E R

41 468 45 34 4 2652 440 2334

121

UNIT 6 PREVIEW

Suggestions

Review the fact that multiplication and division are *opposite* operations.

factor \times factor = product

$8 \times 4 = 32$

product \div factor = factor

$32 \div 4 = 8$

Explain that in multiplication the product is missing, while in division one of the factors is missing.

Have the students find the *missing products* in the following cross-number puzzle. Ask if the number in the lower right corner will always be the product of the across and down products. Why?

\times \rightarrow

\downarrow

5	4	
3	2	

across:
 $(5 \times 4) \times (3 \times 2) = 120$

down:
 $(5 \times 3) \times (4 \times 2) = 120$

Multiplication is commutative.

Ask the students to find *missing factors* after they have determined the rule for each of the following:

36	6			81	9			64	8
24	4			27	3			24	3
48				72				48	
54				36				32	
30				45				56	
42				63				40	

About the Page

Previously learned multiplication and division skills are reviewed on page 121. Students should recognize the various situations that can occur.

- a. missing product \rightarrow multiply
 $8 \times 69 = \square$
- b. missing factor \rightarrow divide
 $238 \div \square = 7$
 $1816 \div 8 = \square$
 $78 \times \square = 312$

The code is meant to be a self-checking device for the students.

Make a factor tree to express each number as a product of prime factors.
Write the product using exponents.

2. 24

3. 30

24. 81

25. 56

26. 120

$2^3 \times 3$

$2 \times 3 \times 5$

3^4

$2^3 \times 7$

$2^3 \times 3 \times 5$

Simplify each expression.

7. $3 + 32 \div 4$ 11

28. $18 - 2 \times 3 + 1$ 13

9. $(11 - 7) \times 6$ 24

30. $(38 - 2) \div (8 + 4)$ 3

Solve for N. Check.

1. $N - 88 = 29$
117

32. $7 \times N = 392$
56

33. $N \div 18 = 8$
144

Complete.

4.

In	Out
N	$50 - N$
6	44
13	37
47	3

35.

In	Out
N	$8 \times (N + 3)$
3	48
5	64
12	120

36.

In	Out
N	$11 + N \div 2$
24	23
38	30
66	44

Objective A25

Understand the concept of multiples; find the LCM.

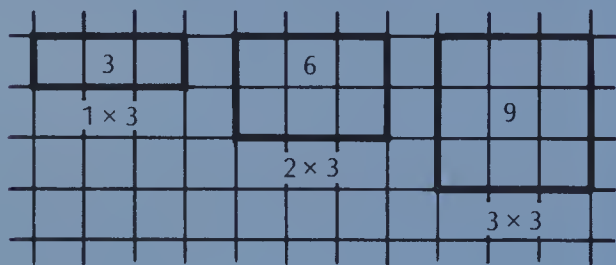
Introducing the Lesson

Review skip counting. Ask the students for examples of situations in which skip counting is used (counting people in rows; counting coins; counting gum drops, etc.).

Teaching the Lesson

Place centicubes on an overhead projector and count them by 4s to illustrate the counting situation described at the top of page 122. Point out how the **multiples** of 4 are named as the counting is done. Count the centicubes by 5s also, naming the multiples of 5.

Give each student a sheet of graph paper. Have them illustrate the multiples of various other numbers. For example, the multiples of three:



Students should realize that any basic fact is a multiple of two numbers: $4 \times 3 = 12$. Twelve is a multiple of 4 and of 3.

Read and discuss the procedure for finding the **LCM (Least Common Multiple)** at the top of page 122. Work the following examples at the chalkboard. See that the students understand the steps involved.

a. What is the **LCM** of 5 and 6?

5: 5, 10, 15, 20, 25, 30, 35, ...

6: 6, 12, 18, 24, 30, 36, ...

LCM = 30

b. What is the **LCM** of 3, 4, and 6?

3: 3, 6, 9, 12, 15, ...

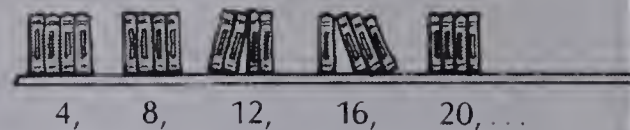
4: 4, 8, 12, 16, ...

6: 6, 12, 18, ...

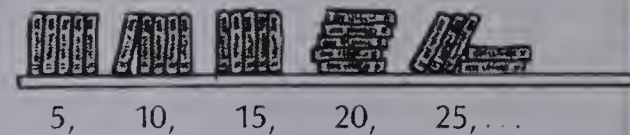
LCM = 12

Multiples and the LCM

As we count by 4s, we name the **multiples** of 4.



As we count by 5s, we name the **multiples** of 5.



The multiples of 4 are: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, ...

The multiples of 5 are: 5, 10, 15, 20, 25, 30, 35, 40, ...

The common multiples of 4 and 5 are: 20, 40, ...

The **Least Common Multiple (LCM)** is 20.

EXERCISES

Write the next seven multiples.

- 3, 6, 9, ■, ■, ■, ... 12, 15, 18, ...
- 4, 8, 12, ■, ■, ■, ... 16, 20, 24, 28, 32, 36, 40
- 6, 12, 18, ■, ■, ■, ... 24, 30, 36, ...
- 10, 20, 30, ■, ■, ■, ... 40, 50, 60, 70, 80, 90, 100
- Write the first ten multiples of 7. 7, 14, 21, 28, 35, 42, 49, 56, 63, 70
- Write the next four multiples of 5 after 35. 40, 45, 50, 55
- Write the multiples of 2 between 16 and 32. 18, 20, 22, 24, 26, 28, 30

Copy the multiples. What is the LCM?

8. 3: 3, 6, 9, 12, ...

9. 2: 2, 4, 6, 8, ...

4: 4, 8, 12, 16, ...

3: 3, 6, 9, 12, ...

LCM = ■ 12

LCM = ■ 6

List the multiples of each. Find the LCM.

10. 6 and 9 **LCM** : 18

11. 3 and 5 **LCM** : 15

12. 4 and 7 **LCM** : 28

13. 2 and 4 **LCM** : 4

Using the Exercises

- Questions 1 to 7 give the students practice with listing multiples. For question 7, see that they understand that the multiples **between** 16 and 32 do **not** include 16 and 32.
- Questions 8 to 13 involve finding the LCM. In questions 8 and 9, the first step in which the sets of multiples are listed is already done. Students have to choose the *lowest* multiple *common* to both sets. For questions 10 to 13, the students must do all the steps for finding the LCM on their own.

PRACTICE

Write the next seven multiples.

- 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
- 8, 16, 24, 32, 40, 48, 56, 64, 72, 80
- 9, 18, 27, 36, 45, 54, 63, 72, 81, 90
- 12, 24, 36, 48, 60, 72, 84, 96, 108, 120
- Write the first ten multiples of 8. 8, 16, 24, 32, 40, 48, 56, 64, 72, 80
- Write the next four multiples of 3 after 22. 24, 27, 30, 33
- Write the multiples of 5 between 79 and 106. 80, 85, 90, 95, 100, 105
- Write the multiples of 4 between 47 and 73. 48, 52, 56, 60, 64, 68, 72

List the multiples of each. Find the LCM.

- 6 and 8 LCM: 24
- 8 and 10 LCM: 40
- 12 and 16 LCM: 48
- 2, 3, and 4 LCM: 12
- 2, 4, and 5 LCM: 20
- 3 and 7 LCM: 21
- 12 and 18 LCM: 36
- 20 and 30 LCM: 60
- 3, 6, and 9 LCM: 18
- 40, 50, and 60 LCM: 600

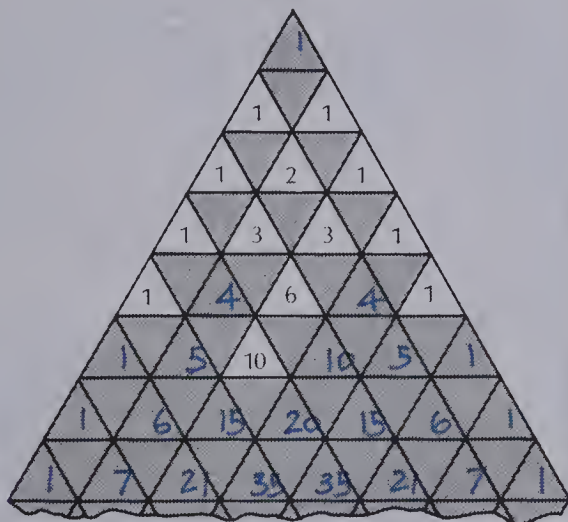
Solve.

- Ann set up an exercise schedule for herself. She planned to do sit-ups and push-ups on Monday. After that, she would do sit-ups on every second day and push-ups on every third day. How many days after Monday would she again do both sit-ups and push-ups on the same day? 6

Pascal's Triangle

Copy the triangle and extend the number pattern.

Each number is the sum of the two number above it.



123

Extra Practice

Write the next six multiples.

- 7, 14, 21, 28, 35, 42, 49, 56, 63
- 11, 22, 33, 44, 55, 66, 77, 88, 99
- 13, 26, 39, 52, 65, 78, 91, 104, 117
- 15, 30, 45, 60, 75, 90, 105, 120, 135

Write the multiples of 6 between 41 and 69. 42, 48, 54, 60, 66

Write the next five multiples of 4 after 36. 40, 44, 48, 52, 56

List multiples of each. Find the LCM

- 8 and 12 8: 8, 16, 24, 32 12: 12, 24, 36
- 6, 4, and 10 6: 6, 12, 18, 24, ... 60 4: 4, 8, 12, 16, ... 60 10: 10, 20, 30, 40, ... 60
- 12 and 15 12: 12, 24, 36, 48, 60, 72 15: 15, 30, 45, 60, 75
- 10, 12, and 20 10: 10, 20, 30, 40, ... 60 12: 12, 24, 36, ... 60 20: 20, 40, 60, 80

Assigning the Practice

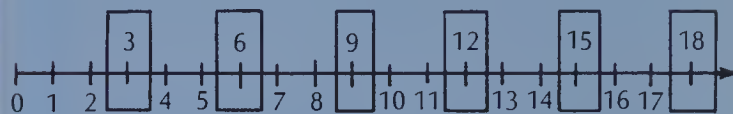
Minimum: 1-18

Average: 1-18

Enriched: 1-19

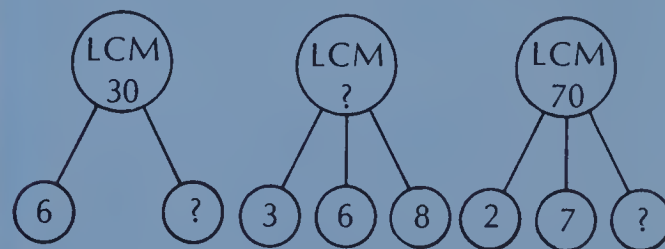
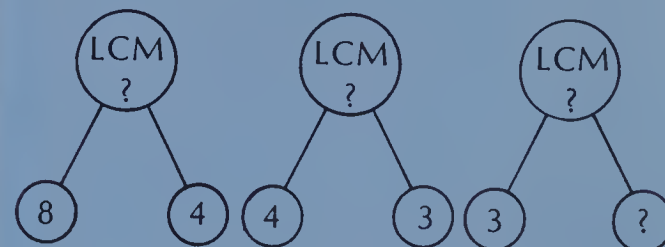
Reinforcement

- Ask the students to plot sets of multiples on number lines and on 100 charts to notice the patterns involved.



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Have the students complete the following LCM puzzles and then make some of their own to exchange with a partner to solve.



Enrichment

Assign *Pascal's Triangle* at the bottom of page 123. Allow time for the students to discuss the number patterns they found as they extended the triangle.

UNIT 6 LESSON 2

Objective A26

Understand the concept of divisibility; know and apply the rules of divisibility by 2, 3, 4, 5, 6, 9, and 10.

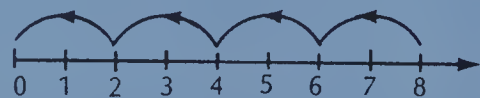
Introducing the Lesson

Sketch the following on the chalkboard.



Ask why 6 and 8 are called *even* and why 5 and 7 are called *odd*.

Have someone name the first ten even numbers and the first ten odd numbers. Use a number line to show that zero must be even.



evens: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, ...
odds: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, ...

Ask the students to explain an easy way to recognize even numbers. (The number has a 0, 2, 4, 6, or 8 in the ones place.)

Teaching the Lesson

As you point out the divisibility rules at the top of page 124, explain that these rules will be invaluable in future math work.

Read, explain, and give several examples for each rule. Test divisibility through actual division. If a number is divisible by a certain number, the quotient has no remainder.

$$\begin{array}{r} 384 \\ 4 \overline{)1536} \end{array} \quad 1536 \text{ is divisible by } 4.$$

Show that if, for example, the following numbers are divisible by 9, then they are also multiples of 9.

27 and 117 are divisible by 9.

$$\begin{array}{r} 3 \\ 9 \overline{)27} \end{array} \quad \begin{array}{r} 13 \\ 9 \overline{)117} \end{array}$$

27 and 117 are multiples of 9.

9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108, 117, ...

Divisibility Rules

2	A number is divisible by 2, if its last digit is 0, 2, 4, 6, or 8	$\begin{array}{r} 2090 \\ 2 \overline{)4180} \\ 1 \end{array}$
3	A number is divisible by 3, if the sum of its digits is divisible by 3.	$\begin{array}{r} 541 \\ 3 \overline{)1623} \\ 1 \end{array}$
4	A number is divisible by 4, if the number formed by its last two digits is divisible by 4.	$\begin{array}{r} 254 \\ 4 \overline{)1016} \\ 21 \end{array}$
5	A number is divisible by 5, if its last digit is 0 or 5.	$\begin{array}{r} 347 \\ 5 \overline{)1735} \\ 23 \end{array}$
6	A number is divisible by 6, if it is divisible by 2 and by 3.	$\begin{array}{r} 937 \\ 6 \overline{)5622} \\ 24 \end{array}$
9	A number is divisible by 9, if the sum of its digits is divisible by 9.	$\begin{array}{r} 379 \\ 9 \overline{)3411} \\ 8 \end{array}$
10	A number is divisible by 10, if its last digit is 0.	$\begin{array}{r} 715 \\ 10 \overline{)7150} \\ 15 \end{array}$

EXERCISES

Which number is **evenly** divisible?

Find its quotient

- by 5: 610 or 612 $\begin{array}{r} 122 \\ 5 \overline{)610} \\ 157 \end{array}$
- by 10: 642 or 640 $\begin{array}{r} 64 \\ 10 \overline{)640} \\ 134 \end{array}$
- by 2: 313 or 314 $\begin{array}{r} 277 \\ 2 \overline{)314} \\ 280 \end{array}$
- by 4: 534 or 536 $\begin{array}{r} 134 \\ 4 \overline{)536} \\ 77 \end{array}$
- by 3: 840 or 842 $\begin{array}{r} 280 \\ 3 \overline{)840} \end{array}$
- by 9: 693 or 683 $\begin{array}{r} 77 \\ 9 \overline{)693} \\ 72 \end{array}$
- by 6: 482 or 483 **neither**
- by 6: 424 or 432 $\begin{array}{r} 72 \\ 6 \overline{)432} \end{array}$

Using the Exercises

- Questions 1 to 8 require the student to prove the divisibility choice made by dividing.

PRACTICE

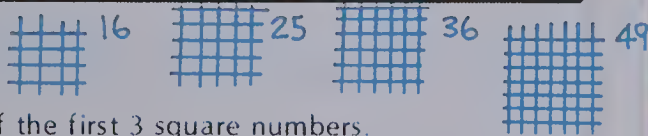
Copy the chart. Write the quotients which have no remainders.

	Divisible	by 2	by 3	by 4	by 5	by 6	by 9	by 10
1.	51		17					
2.	69		23					
3.	87		29					
4.	270	135	90		54	45	30	27
5.	400	200		100	80			40
6.	516	258	172	129		86		
7.	734	367						
8.	705		235		141			
9.	926	463						
10.	5004	2502	1668	1251		834	556	
11.	1116	558	372	279		186	124	
12.	8140	4070		2035	1628			814

Solve.

13. Mrs. Fox bought 42 marigold seedlings. Can she put an equal number in 3 separate garden areas in her yard with none left over? Yes - 14

Square Numbers



The intersections form a picture of the first 3 square numbers. Draw a picture of the next 4 square numbers and name them.

1



1×1 or 1^2

4



2×2 or 2^2

9



3×3 or 3^2

125

Assigning the Practice

Minimum: 1-12

Average: 1-12

Enriched: 1-13

Reinforcement

1. Ask the students to circle the numbers below that are divisible by 3 and to place a box around the numbers divisible by 2. Then have them make a statement about the numbers enclosed by both a box and a circle.

32 36 63 18 81 131
169 516 342 96 615 614

Try the same procedure for those numbers divisible by 9 and 3 using the same numbers.

2. Give each student a chart of the numbers from 1 to 100. Ask the students to cross out the numbers that are divisible by 2, 3, 4, 5, 6, 9, or 10. Discuss the numbers that are left. Are they similar in any way?

3. See if the students can think of a number between 40 and 50 that has four as a divisor. When one is added to the number, the result is a number divisible by nine.

Enrichment

1. Assign *Square Numbers* at the bottom of page 125. Point out that **intersection points** of lines are counted, not the squares.

2. Make a set of problem cards similar to the following:

What numbers under 200 are divisible by 4, 5, and 6?

What is the lowest even number divisible by an odd number?

3. Have the students complete the following charts:

+	even	odd
even		
odd		

×	even	odd
even		
odd		

Extra Practice

Worksheet A26

Complete the chart. Write the quotients which have no remainders. Pages 124-125

Number Divisible	by 2	by 3	by 4	by 5	by 6	by 9	by 10
1. 40	20		10	8			4
2. 77							
3. 96	48	32	24		16		
4. 105		35		21			
5. 350	175			70			35
6. 633		211					
7. 812	406		203				
8. 2430	1215	810		486	405	270	243
9. 8010	4005	2670		1602	1335	890	801
0. 3965				793			

UNIT 6 LESSON 3

Objective A27

Understand the concept of factor; find the GCF.

Introducing the Lesson

Give the students these problems:

- If you have 18 cookies, can they be evenly shared by 2 people? 3 people? 4, 5, 6, 7, 8, or 9 people?
- If you have 24 cookies, can they be evenly shared by 2, 3, 4, 5, 6, 7, 8, or 9 people?

Let the students discover that the divisibility rules help them to answer these questions.

Teaching the Lesson

Review the inverse relationship of multiplication and division by doing the multiplications at the top of page 126.

a. multiplication

factor \times factor = product

$$\begin{array}{rcl} 1 & \times & 14 = 14 \\ 2 & \times & 7 = 14 \end{array}$$

b. division

$$\begin{array}{r|l} \text{factor} & \text{product} \\ \hline 1 & 14 \\ 2 & 14 \end{array} \quad \text{or} \quad \begin{array}{r|l} \text{divisor} & \text{dividend} \\ \hline 2 & 14 \end{array}$$

Point out how *factors* and *divisors* are the same. "2 is a divisor and a factor of 14." Have the students recall, too, that since 14 is *divisible* by 2 it is a *multiple* of 2.

Explain that when all the multiplications of a number are listed, all of its *factors* and its *divisors* are also named.

factors of 20: 1, 2, 4, 5, 10, 20.
20 is evenly divided by 1, 2, 4, 5, 10, and 20.

Explain the procedure for finding the **GCF (Greatest Common Factor)** at the top of page 126. Show a few examples at the chalkboard.

What is the GCF of 12 and 28?

$$\begin{array}{ll} 12 = 1 \times 12 & 28 = 1 \times 28 \\ 2 \times 6 & 2 \times 14 \\ 3 \times 4 & 4 \times 7 \end{array}$$

Factors of 12: 1, 2, 3, 4, 6, 12

Factors of 28: 1, 2, 4, 7, 14, 28

1, 2, and 4 are common factors. GCF = 4

Factors and the GCF

Multiplications with a product of 14.

$$\begin{array}{l} 14 = 1 \times 14 \\ 14 = 2 \times 7 \end{array}$$

The **factors** of 14 are: 1, 2, 7, 14

Multiplications with a product of 20.

$$\begin{array}{l} 20 = 1 \times 20 \\ 20 = 2 \times 10 \\ 20 = 4 \times 5 \end{array}$$

The **factors** of 20 are: 1, 2, 4, 5, 10, 20

Factors of 14: 1, 2, 7, 14

Factors of 20: 1, 2, 4, 5, 10, 20

14 and 20 have two **common** factors, 1 and 2.

The **Greatest Common Factor (GCF)** of 14 and 20 is 2.

EXERCISES

Write all of the multiplications for each product. List the factors.

1. $24 = 1 \times \blacksquare$ $24 = 2 \times \blacksquare$
 $24 = 3 \times \blacksquare$ $24 = 4 \times \blacksquare$
 $24 = 6 \times \blacksquare$ $24 = 8 \times \blacksquare$
 $24 = 12 \times \blacksquare$ $24 = 24 \times \blacksquare$

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

2. $54 = 1 \times \blacksquare$ $54 = 2 \times \blacksquare$
 $54 = 3 \times \blacksquare$ $54 = 6 \times \blacksquare$
 $54 = 9 \times \blacksquare$ $54 = 18 \times \blacksquare$
 $54 = 27 \times \blacksquare$ $54 = 54 \times \blacksquare$

Factors of 54: 1, 2, 3, 6, 9, 18, 27, 54

3. 15
 $15 = 1 \times 15$
 $15 = 3 \times 5$

4. 28
 $28 = 1 \times 28$
 $28 = 2 \times 14$
 $28 = 4 \times 7$

5. 13
 $13 = 1 \times 13$

6. 21
 $21 = 1 \times 21$
 $21 = 3 \times 7$

Answer yes or no.

- Is 3 a factor common to 18 and 15? **Yes**
- Is 9 a factor common to 81 and 89? **No**
- Is 16 a factor common to 16 and 32? **Yes**
- Is 5 a factor common to 35 and 48? **No**
- Is 8 a factor common to 80 and 120? **Yes**

List the factors for each. Find the GCF.

- 4 and 6 **GCF: 2**
- 6 and 8 **GCF: 2**
- 9 and 15 **GCF: 3**
- 12 and 18 **GCF: 6**
- 3 and 7 **GCF: 1**
- 13 and 19 **GCF: 1**
- 24 and 32 **GCF: 8**
- 18 and 30 **GCF: 6**
- 7 and 9 **GCF: 1**

Using the Exercises

- Questions 1 to 6 require the students to list all factors of given numbers. Encourage them to use the divisibility rules. Some students may be unable to list the factors without naming all the multiplications for a number.
- Questions 7 to 11 ask about common factors. In some cases divisibility rules can be used.
- Questions 12 to 20 require the students to find the GCF for a pair of numbers.

PRACTICE

Write all of the multiplications for each product. List the factors

- | | | | |
|-------|---------|--------|--------|
| 1. 36 | 2. 23 | 3. 48 | 4. 56 |
| 5. 49 | 6. 47 | 7. 72 | 8. 51 |
| 9. 60 | 10. 100 | 11. 19 | 12. 64 |

Find the GCF.

- | | | |
|-------------------------|---------------------------|-------------------------|
| 13. 16 and 18 2 | 14. 17 and 29 1 | 15. 63 and 90 9 |
| 16. 25 and 38 1 | 17. 42 and 33 3 | 18. 15 and 26 1 |
| 19. 39 and 52 13 | 20. 100 and 120 20 | 21. 48 and 60 12 |
| 22. 45 and 75 15 | 23. 14 and 49 7 | 24. 60 and 90 30 |

Solve.

25. Mrs. Taylor baked 54 oatmeal cookies and 57 chocolate chip cookies. How many boxes can she make up each containing equal numbers of each kind of cookie? **3 boxes**
26. Can 81 pennies and 54 nickels be shared equally by 9 children? **Yes**
27. Ms. Frank shelved 21 math books and 49 readers. How many shelves does she use if each shelf holds equal numbers of each kind of book? **7**
28. Mr. Holt packed away 24 red books, 60 blue books, and 48 green books. The cartons will not hold more than 20 books. How many cartons did he make up if each contained equal numbers of each colour of book? **6 cartons**

Cubic Numbers

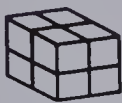
The pictures show the first three cubic numbers

Draw a picture of the next 4 cubic numbers and name them.



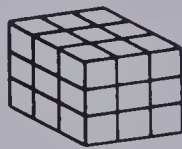
$$1 \times 1 \times 1 \text{ or } 1^3$$

8



$$2 \times 2 \times 2 \text{ or } 2^3$$

27



$$3 \times 3 \times 3 \text{ or } 3^3$$

127

64, 125, 216, 343

Assigning the Practice

Minimum: odd numbers

Average: even numbers

Enriched: 15-28

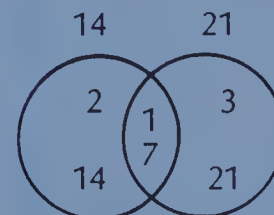
Reinforcement

- Have the students name all of the factors of 27, 36, 42, 48, and 60. Show them that this can be accomplished by writing the multiplications and/or using the divisibility rules.
- Divide the students into teams. Have the students use calculators to find all the factors of 250, 625, 810, and other large numbers. Time their calculations. The team finding all the factors of a number first wins.
- Have the students complete the following chart by placing a " \div " to show that a number on the left is divisible by a number on the top.

	2	3	4	5	6	7	8	9
12	\div	\div						
15		\div						
18	\div							
24								
36								
40								
48								
60								
90								
144								

Enrichment

- Assign *Cubic Numbers* at the bottom of page 127.
- Show how Venn Diagrams can be used to show common factors.



Common factors:
1 and 7

GCF: 7

Ask students to draw Venn Diagrams to show common factors and the GCF for 45 and 42; 26 and 52; 15, 12, and 6.

Extra Practice

Worksheet A27

Pages 126-127

Write all multiplications for each product. List the factors.

- | | |
|--|--|
| 1. $1 \times 44, 2 \times 22, 4 \times 11$
44: 1, 2, 4, 11, 22, 44 | 2. $1 \times 96, 2 \times 48, 3 \times 32, 4 \times 24, 6 \times 16, 8 \times 12$
96: 1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 96 |
| 3. $1 \times 90, 2 \times 45, 3 \times 30, 5 \times 18, 6 \times 15$
90: 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90 | 4. $1 \times 108, 2 \times 54, 3 \times 36, 4 \times 27, 6 \times 18, 9 \times 12$
108: 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 108 |
| 5. 80 and 100: 1, 2, 4, 5, 8, 10, 16, 20 , 40, 80 | 6. 21 and 35: 1, 3, 7 , 21, 35, 7 , 35 |
| 7. 27 and 43: 1 , 3, 9, 27 | 8. 39 and 81: 1, 3 , 13, 39, 81, 3 , 9, 27, 81 |

Solve.

- Mr. Trant's classroom has only 18 dictionaries and 15 poetry books. He divided his class into groups and gave each group the same number of dictionaries. Then he gave the groups equal numbers of poetry books. How many groups were there? **3**

UNIT 6 LESSON 4

Objective A28

Understand the concepts of prime number and composite number.

Introducing the Lesson

List the numbers from 1 to 40 on the chalkboard. Have the students name all of the factors for each number. Circle the numbers which have **only two factors**. Explain that these are called **prime numbers**.

Place a box around the numbers with **more than two factors**. These are called **composite numbers**.

Point out that the number 1 is neither prime nor composite.

Teaching the Lesson

Read and discuss the examples at the top of page 128. Let the students experiment with centicubes to find that a prime number makes only two rectangular arrays and that a composite number makes more than two rectangular arrays.

Give each student a 100 chart to mark in various colours to find the 25 prime and 74 composite numbers to 100. The chart also shows the prime factors of composite numbers. Start by circling the first five primes: 2, 3, 5, 7, and 11. Mark the multiples of these primes as shown, then circle the remaining primes.



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72								

Prime and Composite Numbers

19 is divisible only by 1 and 19.

The factors of 19 are: 1, 19.

When a number has **only two factors**, it is called a **prime number**.

25 is divisible by 1, 5, and 25.

The factors of 25 are: 1, 5, 25.

When a number has **more than two factors**, it is called a **composite number**.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

EXERCISES

List the factors for each. Write prime or composite.

- 4 **1, 2, 4 C**
- 2 **1, 2 P**
- 13 **1, 13 P**
- 7 **1, 7 P**
- 49 **1, 7, 49 C**
- 22 **1, 2, 11, 22 C**
- 41 **1, 41 P**
- 24 **1, 2, 3, 4, 6, 8, 12, 24 C**

Write the prime numbers in each group.

- 10, 11, 12, 13 **11, 13**
- 20, 21, 22, 23 **23**
- 3, 5, 7, 9 **3, 5, 7**

Write the composite numbers in each group.

- 14, 15, 16, 17 **14, 15, 16**
- 30, 31, 32, 33 **30, 32, 33**
- 70, 71, 72, 73 **70, 72, 73**
- Write all of the prime numbers less than 20. **2, 3, 5, 7, 11, 13, 17, 19**
 - Write all of the composite numbers less than 20. **4, 6, 8, 9, 10, 12, 14, 15, 16, 18**
 - Write all of the prime numbers greater than 20 but less than 30. **23, 29**

Using the Exercises

- Questions 1 to 8 require the student to use the definitions for a prime and a composite number as they list the factors of numbers and then tell if they are prime or composite.
- Questions 9 to 14 require the students to pick out the prime or composite numbers within a set of numbers.
- Question 15 requires the students to list a specific set of prime and composite numbers.

PRACTICE

Is the number prime or composite?

1. 17 **P**
2. 27 **C**
3. 45 **C**
4. 57 **C**
5. 61 **P**
6. 51 **C**
7. 63 **C**
8. 73 **P**
9. 95 **C**
10. 84 **C**
11. 83 **P**
12. 93 **C**
13. 29 **P**
14. 49 **C**
15. 69 **C**
16. 200 **C**
17. 108 **C**
18. 111 **C**
19. 101 **P**
20. 117 **C**

21. Write the prime numbers between 20 and 50.

23, 29, 31, 37, 41, 43, 47

22. Write the composite numbers between 30 and 45.

32, 33, 34, 35, 36, 38, 39, 40, 42, 44

Solve.

23. Which number of gum drops is impossible to share evenly with other people: 57 or 59? **59**

24. Which number of books couldn't you share equally with friends: 12 or 13? **13**

25. What is the largest prime less than 21? **19**

26. What is the smallest prime greater than 49? **53**

27. Which divisibility rule shows that 171 is not prime? **3**

28. Which divisibility rule shows that 51 is composite? **3**

Twin Primes

Prime numbers that have a difference of 2 are called **twin primes**.

3 5 (17 19) 59 61
5 7 41 43 71 73
11 13 51 53 89 91

Can you find the other seven twin primes that are less than 100?



129

Assigning the Practice

Minimum: 1-15, 21-25

Average: 5-28

Enriched: 5-28

Reinforcement

1. Ask the students to name a divisibility rule which proves the following numbers to be composite.

- a. 57
- b. 770
- c. 873
- d. 412
- e. 513
- f. 111

2. Have the students complete the following chart:

Number	Factors	Prime or Composite?
2		
9		
15		
17		
21		
23		
32		
36		
41		
50		

3. Ask the students to find the GCF of these pairs of prime numbers. What can be concluded?

- a. 17 and 19
- b. 2 and 13
- c. 23 and 31
- d. 43 and 47

Enrichment

1. Assign *Twin Primes* at the bottom of page 129.

2. Let the students test Goldback's Conjecture (that every even number can be expressed as the sum of two prime numbers) with these even numbers:

- a. $4 = \underline{\quad} + \underline{\quad}$
- b. $6 = \underline{\quad} + \underline{\quad}$
- c. $8 = \underline{\quad} + \underline{\quad}$
- d. $10 = \underline{\quad} + \underline{\quad}$
- e. $12 = \underline{\quad} + \underline{\quad}$
- f. $14 = \underline{\quad} + \underline{\quad}$
- g. $16 = \underline{\quad} + \underline{\quad}$
- h. $18 = \underline{\quad} + \underline{\quad}$
- i. $20 = \underline{\quad} + \underline{\quad}$

Extra Practice

Worksheet A28

Pages 128-129

Is the number prime or composite?

1. 13 **P**
2. 29 **P**
3. 39 **C**
4. 45 **C**
5. 47 **P**
6. 81 **C**
7. 89 **P**
8. 93 **C**
9. 107 **P**
10. 121 **C**
11. 117 **C**
12. 327 **C**

Write the composite numbers less than 24. **4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22**

Write the prime numbers between 15 and 25. **17, 19, 23**

Write the prime numbers between 35 and 45. **37, 41, 43**

Solve.

I am a composite number divisible by 2, 3, 4, and 6. The number seven more than me is a composite number. The number seven less than me is a prime number. Who am I? **48**

UNIT 6 LESSON 5

Objective A29

Find the prime factors of a number using a factor tree.

Introducing the Lesson

Review the meaning and use of exponents with these kinds of questions.

“Name the base and the exponent in 3^4 .”

“What multiplication does 3^4 represent?”

“Write $4 \times 4 \times 4 \times 4 \times 4$ using an exponent.”

Teaching the Lesson

Write the number 12 on the chalkboard. Ask someone to name the factors of 12. Then ask someone else to circle the factors that are prime.

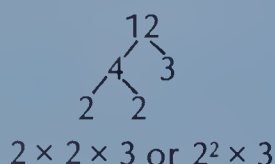
factors of 12: 1, 2, 3, 4, 6, 12

prime factors of 12: 2, 3

Explain that 12 has 6 factors, but only two prime factors, 2 and 3. Ask the students to write 12 as a product of prime numbers. $2 \times 2 \times 3$

Point out that this product of prime numbers can also be written using exponents. $2 \times 2 \times 3 = 2^2 \times 3$

Show how one can use a factor tree to get the prime factors of 12.



Read and discuss the lesson examples at the top of page 130. Provide as much practice with other numbers at the chalkboard as is needed for the students' understanding.

Explain how 72 written as a product of prime factors can be used to find other factors of 72.

$$\begin{aligned} & \boxed{2 \times 2 \times 2} \times \boxed{3 \times 3} \text{ or } 8 \times 9 \\ & \boxed{2 \times 2} \times \boxed{2 \times 3 \times 3} \text{ or } 4 \times 18 \\ & \boxed{2} \times \boxed{2 \times 2 \times 3 \times 3} \text{ or } 2 \times 36 \\ & \boxed{2 \times 3} \times \boxed{3 \times 2 \times 2} \text{ or } 6 \times 12 \end{aligned}$$

The GCF of 36 and 72.

$$72: \boxed{2} \times \boxed{2 \times 2 \times 3 \times 3}$$

$$36: 2 \times 2 \times 3 \times 3$$

$$\text{GCF} = 36$$

Prime Factors

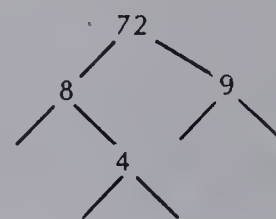
The factors of 72 are: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72.

Only 2 and 3 are **prime** numbers.

The **prime factors** of 72 are: 2, 3.

The **prime factors** of 72 can be found using a **factor tree**.

Any number can be written as a product of its prime factors.



$$72 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

$$= 2^4 \times 3^2$$

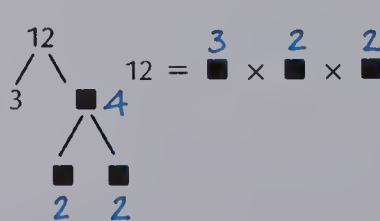
The prime factors can be multiplied to find other factors.

For example, $2 \times 2 \times 3 = 12$ is a factor of 72.

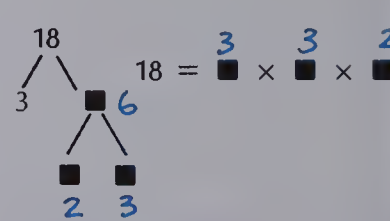
EXERCISES

Use a factor tree to write the number as a product of prime factors.

1.



2.



3.

$$20 = 2 \times 2 \times 5$$

4.

$$24 = 2 \times 2 \times 2 \times 3$$

5.

$$27 = 3 \times 3 \times 3$$

6.

$$30 = 2 \times 3 \times 5$$

Rewrite using exponents.

7.

$$3 \times 3 \times 2 \times 2 = 3^2 \times 2^2$$

8.

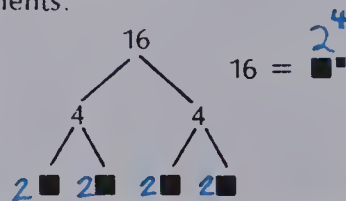
$$2 \times 2 \times 5 = 2^2 \times 5$$

9.

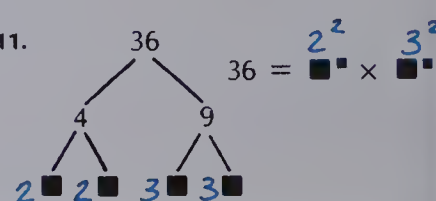
$$7 \times 7 \times 2 \times 2 \times 2 = 7^2 \times 2^3$$

Use a factor tree to find the prime factors. Write the product using exponents.

10.



11.



130

Using the Exercises

- Questions 1 to 6 require the students to use a factor tree to write the numbers as a product of prime factors.
- Questions 7 to 9 ask the students to rewrite products using exponents.
- Questions 10 and 11 require that the product of prime factors be written using exponents.

PRACTICE

Use a factor tree to write the number as a product of prime factors.

Write the answer without using exponents.

1. 42 $2 \times 3 \times 7$
2. 45 $3 \times 3 \times 5$
3. 52 $2 \times 2 \times 13$
4. 36 $2 \times 3 \times 2 \times 3$
5. 66 $2 \times 3 \times 11$
6. 77 7×11
7. 63 $3 \times 3 \times 7$
8. 75 $3 \times 5 \times 5$

Use a factor tree to write the number as a product of prime factors.

Write the answer using exponents.

9. 60 $2^2 \times 3 \times 5$
10. 54 $3^3 \times 2$
11. 24 $2^3 \times 3$
12. 100 $2^2 \times 5^2$
13. 48 $2^4 \times 3$
14. 27 3^3
15. 32 2^5
16. 72 $2^3 \times 3^2$
17. 125 5^3
18. 64 2^6
19. 81 3^4
20. 500 $2^2 \times 5^3$

Use factor trees to help find the GCF.

21. 45 and 36 9
22. 26 and 55 1
23. 60 and 72 12
24. 70 and 98 14
25. 64 and 256 64
26. 175 and 81 1
27. 96 and 144 48
28. 48, 32, and 72 8

REVIEW

List the multiples for each. Find the LCM.

1. 4 and 6 $4: 4, 8, 12, 16$ $6: 6, 12, 18, 24$ LCM: 12
2. 10 and 12 $10: 10, 20, 30, 40, 50, 60$ $12: 12, 24, 36, 48, 60$ LCM: 60
3. 5 and 6 $5: 5, 10, 15, 20, 25, 30$ $6: 6, 12, 18, 24, 30$ LCM: 30

Is 34 750 divisible by:

4. 2? Yes
5. 5? Yes
6. 9? No
7. 4? No
8. 6? No

List the factors for each. Find the GCF.

9. 6 and 9 $6: 1, 2, 3, 6$ $9: 1, 3, 9$ GCF: 3
10. 12 and 18 $12: 1, 2, 3, 4, 6, 12$ $18: 1, 2, 3, 6, 9, 18$ GCF: 6
11. 24 and 36 $24: 1, 2, 3, 4, 6, 8, 12, 24$ $36: 1, 2, 3, 4, 6, 9, 12, 18, 36$ GCF: 12

Is the number prime or composite?

12. 19 P
13. 49 C
14. 50 C
15. 61 P
16. 87 C

Use a factor tree to express the number as a product of prime factors.

Write the answer using exponents.

17. 8 2^3
18. 20 $2^2 \times 5$
19. 100 $2^2 \times 5^2$
20. 60 $2^2 \times 3 \times 5$
21. 90 $2 \times 3^2 \times 5$

131

Assigning the Practice

Minimum: 1-20

Average: 1-20

Enriched: 5-8, 13-28

Review Exercises

Questions	Objectives	Pages
1-3	A25	122-123
4-8	A26	124-125
9-11	A27	126-127
12-16	A28	128-129
17-21	A29	130-131

Reinforcement

1. Have the students draw a line to match each number with its product of prime factors.

Number	Product of prime factors
27	2×11
52	$2 \times 2 \times 13$
22	$3 \times 3 \times 3$
25	$2 \times 2 \times 2 \times 2 \times 2$
60	5×5
32	$2 \times 2 \times 3 \times 5$

2. Ask the students to fill in the missing prime factors.

- a. $6 = \square \times 3$
- b. $77 = 7 \times \square$
- c. $28 = 2 \times \square \times 2$
- d. $57 = 3 \times \square$
- e. $20 = 2 \times \square \times \square$
- f. $100 = 2 \times \square \times 5 \times \square$
- g. $24 = 2 \times \square \times 3 \times \square$
- h. $51 = 3 \times \square$

3. Have the students read the markings they made on the 100 chart in Lesson 4 to find the prime factors and the products of prime factors for numbers.

Enrichment

1. Ask the students to express the following as products of prime numbers using exponents.

- a. 2500
- b. 2304
- c. 1024
- d. 6912

2. Have the students find the GCF of 90 and 135 in two ways:

- a. by listing all factors of each number.
- b. by finding their products of prime numbers.

Which way is easier?

Extra Practice

Worksheet A29

Pages 130-131

Use a factor tree to write the number as a product of prime factors.

Then write the product using exponents.

1. 44
Factor tree: $44 \rightarrow 11 \times 4 \rightarrow 11 \times 2 \times 2$
Answer: $2^2 \times 11$
2. 80
Factor tree: $80 \rightarrow 8 \times 10 \rightarrow 2 \times 2 \times 2 \times 2 \times 5$
Answer: $2^4 \times 5$
3. 105
Factor tree: $105 \rightarrow 21 \times 5 \rightarrow 3 \times 7 \times 5$
Answer: $3 \times 7 \times 5$
4. 225
Factor tree: $225 \rightarrow 45 \times 5 \rightarrow 9 \times 5 \times 5 \rightarrow 3 \times 3 \times 3 \times 5 \times 5$
Answer: $3^2 \times 5^2$
5. 26
Factor tree: $26 \rightarrow 2 \times 13$
Answer: 2×13
6. 87
Factor tree: $87 \rightarrow 3 \times 29$
Answer: 3×29
7. 480
Factor tree: $480 \rightarrow 48 \times 10 \rightarrow 6 \times 8 \times 2 \times 5 \rightarrow 2 \times 3 \times 2 \times 2 \times 2 \times 5$
Answer: $2^5 \times 3 \times 5$
8. 963
Factor tree: $963 \rightarrow 321 \times 3 \rightarrow 107 \times 3$
Answer: $3^2 \times 107$

Objective A30

Simplify number expressions by doing multiplication and division before addition and subtraction.

Introducing the Lesson

Write the following expressions on the chalkboard. Discuss how the **order** for adding or multiplying will not affect the result. Addition and multiplication are *commutative*.

$$8 + 3 + 5$$

$$2 \times 3 \times 4$$

$$= 11 + 5 \text{ or } = 8 + 8 \quad = 6 \times 4 \text{ or } 2 \times 12$$

$$= 16 \quad = 16 \quad = 24 \quad = 24$$

Write these expressions on the chalkboard. Let the students attempt to find their results and discover that the **order** in which the operations are done affects the result.

$$12 - 8 - 4 \quad 19 - 8 + 5$$

$$24 \div 6 \div 2 \quad 4 + 6 - 2$$

Talk about the need for rules regarding the order in which operations are to be done in order to avoid confusion. Explain that for the above four expressions the rule is:

Work from left to right.

$$(12 - 8) - 4 \quad (19 - 8) + 5$$

$$(24 \div 6) \div 2 \quad (4 + 6) - 2$$

Teaching the Lesson

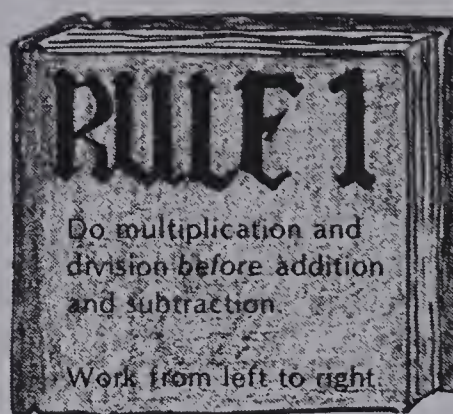
Write $4 + 3 \times 2$ on the chalkboard. Have the students study it and determine the result. Is it $4 + 3 \times 2 = 14$ or $4 + 3 \times 2 = 10$? Point out that 10 is the correct answer because of the rule: *Multiplication and division are done before addition and subtraction; then work from left to right.*

Read and discuss Rule 1 and the examples at the top of page 132. For the first expression shown, explain how the division ($6 \div 2$) was done first. For the second expression, point out that the multiplication (9×2) was done first and then the work was done from left to right.

Provide practice with several other similar expressions.

Order of Operations

Use Rule 1 to *simplify* number expressions.



$$45 - 6 \div 2$$

$$= 45 - 3$$

$$= 42$$

$$38 + 9 \times 2 - 6 + 2$$

$$= 38 + 18 - 6 + 2$$

$$= 56 - 6 + 2$$

$$= 50 + 2$$

$$= 52$$

EXERCISES

Copy and simplify the expression.

1. $68 + 9 \times 3$

$$= 68 + \blacksquare 27$$

$$= \blacksquare 95$$

2. $49 - 2 \times 4 + 6$

$$= 49 - \blacksquare 8 + 6$$

$$= \blacksquare 41 + 6$$

$$= \blacksquare 47$$

3. $25 \div 5 + 6 - 4$

$$= \blacksquare 5 + 6 - 4$$

$$= \blacksquare 11 - 4$$

$$= \blacksquare 7$$

4. $15 - 3 \div 1 + 2$

$$= 15 - \blacksquare + 2$$

$$= \blacksquare 12 + 2$$

$$= \blacksquare 14$$

5. $27 + 4 - 8 \div 2$

$$= 27 + 4 - \blacksquare 4$$

$$= 31 - \blacksquare 4$$

$$= \blacksquare 27$$

6. $60 + 16 \div 4 - 4$

$$= 60 + \blacksquare 4 - 4$$

$$= \blacksquare 64 - 4$$

$$= \blacksquare 60$$

7. $46 - 3 + 2$

$$45$$

8. $97 + 6 \div 2$

$$100$$

9. $7 + 5 \times 3 - 6$

$$16$$

10. $18 \div 2 + 4 \times 3$

$$21$$

Using the Exercises

- Questions 1 to 10 require the student to simplify number expressions applying Rule 1. The first six expressions have been partially simplified and the student can follow the black square to see which operation should be done first in each step. The last four expressions are to be simplified completely by the students. See that they do each step of the work as the examples have shown. In other words, for each step only one operation is done.

PRACTICE

Copy and simplify the expression.

1. $35 + 6 \times 3 = 53$
2. $15 \div 5 - 2 = 1$
3. $27 - 6 + 4 = 25$
4. $18 \div 3 \div 2 = 3$
5. $90 - 48 \div 6 = 82$
6. $35 + 7 \times 4 = 63$
7. $12 \times 2 \div 8 = 3$
8. $16 + 12 - 3 = 25$
9. $16 - 2 + 3 \times 3 = 23$
10. $9 \times 8 - 4 + 2 = 20$
11. $79 + 42 \div 7 - 18 = 67$
12. $150 - 10 + 5 \times 2 = 130$
13. $16 \div 2 + 25 \div 5 = 13$
14. $84 - 6 \times 6 + 6 = 54$
15. $15 + 2 \times 2 + 3 = 22$
16. $60 - 4 + 9 \div 3 = 59$
17. $18 \times 10 + 35 \div 7 = 185$
18. $24 + 28 \div 4 - 2 = 29$
19. $73 - 20 \div 4 + 1 = 69$
20. $32 + 38 - 6 \div 6 = 69$

Write the expression

21. four minus three times one $4 - 3 \times 1$
22. twenty-five divided by five plus six $25 \div 5 + 6$
23. the difference of six times eight and seventeen $6 \times 8 - 17$
24. the sum of fifty-two and thirty divided by ten $52 + 30 \div 10$
25. the difference of two times three and ninety times three $90 \times 3 - 2 \times 3$
26. the difference of nine times two and nine times eleven $9 \times 11 - 9 \times 2$

USING THE CALCULATOR

Use a calculator to find the answer

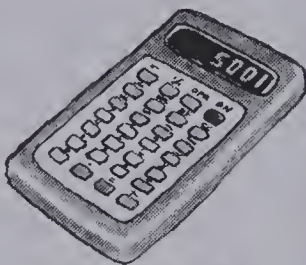
a. $5001 - 3584 + 2072 \div 37 = 1473$

b. $157 - 30174 \div 321 + 168 = 231$

c. $7934 + 6526 - 1487 = 12973$

d. $302 + 1050 \div 14 + 866 = 1243$

e. $48 \times 52 - 1081 \div 47 = 2473$



133

Assigning the Practice

Minimum: 1-22

Average: 3-24

Enriched: 5-26

Reinforcement

1. Assign *Using the Calculator* at the bottom of page 133. Discuss how most calculators have the order of operations rules programmed into them. If possible, have the students test various kinds of calculators for this feature.

2. Ask the students to simplify the following number expressions and then write a statement about the order in which each of the four operations must be done.

- | | |
|--------------------------|--------------------------|
| a. $19 + 6 + 12$ | b. $8 + 17 + 5$ |
| c. $35 - 10 - 2$ | d. $29 - 12 - 4$ |
| e. $9 \times 6 \times 3$ | f. $8 \times 4 \times 7$ |
| g. $50 \div 10 \div 2$ | h. $32 \div 8 \div 2$ |

3. Have the students match the equal expressions in columns A and B.

A	B
$20 \div 5 - 2$	$30 - 7 \times 3 + 4$
$27 \div 9 \times 2$	$3 \times 4 - 20 \div 2$
$4 \times 7 - 5 \times 3$	$16 + 5 - 2 + 5$
$6 + 9 \div 3 - 4$	$5 + 9 \div 9$
$6 \times 8 \div 2 \times 1$	$27 - 3 \times 8 + 2$

Enrichment

Ask the students to simplify these expressions and then devise others for the class to simplify.

- a. $100 \div 2 \times 10 \div 5 \div 10 \times 3$
- b. $48 \div 2 \div 1 \div 3 \div 2 \div 2$
- c. $60 + 8 - 14 - 6 - 3 \times 3$
- d. $6 \times 9 - 3 \div 3 + 9 \times 3$
- e. $8 + 9 \times 4 \div 6 \div 2 - 5$
- f. $29 - 12 \div 3 - 5 - 11 - 8$

Extra Practice

Worksheet A30

Pages 132-133

Simplify the expression.

1. $100 - 36 \div 6$ $= 100 - 6$ $= 94$	2. $45 + 2 \times 3$ $= 45 + 6$ $= 51$	3. $9 \times 4 \div 6$ $= 36 \div 6$ $= 6$	4. $42 + 8 - 5$ $= 50 - 5$ $= 45$
5. $65 + 40 \div 8 - 10$ $= 65 + 5 - 10$ $= 70 - 10$ $= 60$	6. $7 \times 4 - 3 \times 5$ $= 28 - 3 \times 5$ $= 28 - 15$ $= 13$	7. $28 - 4 + 5 \times 7$ $= 28 - 4 + 35$ $= 24 + 35$ $= 59$	8. $280 - 100 \times 2 + 3$ $= 280 - 200 + 3$ $= 80 + 3$ $= 83$

Write the expression and then simplify it.

9. thirteen minus four times two
 $13 - 4 \times 2 = 13 - 8 = 5$
10. thirty divided by six minus one
 $30 \div 6 - 1 = 5 - 1 = 4$

Objective A31

Simplify number expressions by doing the work inside the parentheses first.

Introducing the Lesson

Write the following on the chalkboard:

Luncheon Special	
Hamburger	90¢
Milkshake	60¢

Ask the students for the correct way to write the cost of three luncheon specials.

$$\begin{aligned} 3 \times 90¢ + 60¢ &= 270¢ + 60¢ = \$3.30 \\ 3 \times (90¢ + 60¢) &= 3 \times 150¢ = \$4.50 \end{aligned}$$

Explain that parentheses are used to clarify meaning and to indicate that an operation is to be done first. Hence, \$4.50 is the cost of 3 luncheon specials.

Teaching the Lesson

Read and discuss Rule 2 and the examples at the top of page 134. Have the students simplify the expressions according to both rules and compare the results.

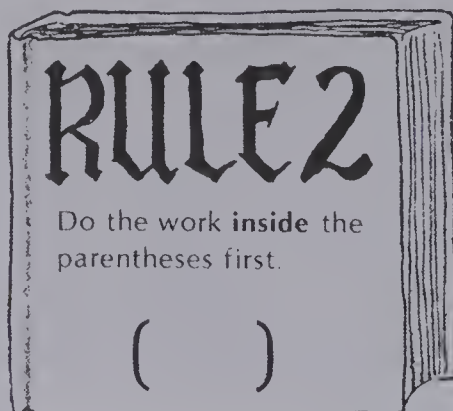
Write the following expressions on the chalkboard. Explain how Rule 2 works together with previously learned order-of-operations rules when simplifying these expressions.

- a. $40 + (6 + 2) \div 4$ Rule 2: parentheses first
 $= 40 + 8 \div 4$ Rule 1: division first
 $= 40 + 2$
 $= 42$
- b. $10 - 4 + 5 \times (9 - 3)$ Rule 2: parentheses first
 $= 10 - 4 + 5 \times 6$ Rule 1: multiplication first
 $= 10 - 4 + 30$ left to right
 $= 6 + 30$
 $= 36$

Give the students practice with several other similar examples.

Order of Operations

Use Rule 2 to simplify number expressions.



$$\begin{aligned} 50 \times 2 + 3 \\ = 100 + 3 \\ = 103 \end{aligned}$$

Compare

$$\begin{aligned} 50 \times (2 + 3) \\ = 50 \times 5 \\ = 250 \end{aligned}$$

$$\begin{aligned} 16 + 4 - 5 + 8 \\ = 23 \end{aligned}$$

Compare

$$\begin{aligned} (16 + 4) - (5 + 8) \\ = 20 - 13 \\ = 7 \end{aligned}$$

EXERCISES

Copy and simplify the expression.

- $8 \times (15 + 25)$
 $= 8 \times \blacksquare 40$
 $= \blacksquare 320$
- $86 + (65 - 35)$
 $= 86 + \blacksquare 30$
 $= \blacksquare 116$
- $(67 + 80) \times (6 - 5)$
 $= \blacksquare 147 \times \blacksquare 1$
 $= \blacksquare 147$
- $(89 - 20) \div (12 - 9)$
 $= \blacksquare 69 \div \blacksquare 3$
 $= \blacksquare 23$
- $42 \times (15 - 7)$
 $= 42 \times \blacksquare 8$
 $= \blacksquare 336$
- $100 \div (19 - 15)$
 $= 100 \div \blacksquare 4$
 $= \blacksquare 25$
- $(16 + 4) \times (8 - 2)$
 $= \blacksquare 20 \times \blacksquare 6$
 $= \blacksquare 120$
- $(25 + 9) \div (60 - 43)$
 $= \blacksquare 34 \div \blacksquare 17$
 $= \blacksquare 2$
- $11 + (40 - 25)$ 26
- $(9 + 3) \div (8 - 4)$ 3
- $72 \div (14 - 5)$ 8
- $(16 - 8) \times (24 + 6)$ 240

Using the Exercises

- Questions 1 to 12 require the student to simplify number expressions applying Rule 2. The first eight expressions have been partially simplified and the student can follow the black square to see which operation should be done first in each step. The last four expressions are to be simplified completely by the students. See that they do each step of the work as the examples have shown. In other words, for each step only one operation is done.

PRACTICE

Simplify each expression.

- $3 \times (15 - 4)$ 33
- $(60 + 90) \div (6 - 2)$ 37.5
- $(8 \div 4) \times (95 - 25)$ 140
- $8 \times (50 - 40)$ 80
- $150 \div (72 \div 12)$ 25
- $(44 - 24) \times (35 - 15)$ 400
- $(56 - 34) \times (126 + 74)$ 4400
- $600 \div (285 + 15)$ 2
- $486 \times (85 - 85)$ 0
- $(21 - 21) \times (21 - 21)$ 0
- $592 \times (793 - 793)$ 0
- $(2 \times 72) \div (720 \div 5)$ 1
- $(46 \div 2) \times (18 - 18)$ 0
- $847 \div (11 \times 11)$ 7

Simplify. Use $<$, $=$, or $>$.

- $88 \times (8 - 8)$ $\blacksquare < 8 + 8 + 8 - 8$
- $(6 \div 6) \times (6 - 6)$ $\blacksquare = 6 \div 6 - 6 \div 6$
- $4 - 4 + 4$ $\blacksquare = 4 \times (4 \div 4)$
- $7 \times 7 - (7 - 7)$ $\blacksquare < 77 - (7 + 7)$
- $(9 \times 9) \div (9 \times 9)$ $\blacksquare < 9 \times (99 \div 99)$
- $3 \times (33 - 33)$ $\blacksquare < 3 \times 3 - (3 + 3)$

Write the expression.

- two times the sum of 14 and 22 $2 \times (14 + 22)$
- nine times the difference between 150 and 127 $9 \times (150 - 127)$
- the sum of 6 and 9 divided by the difference between 31 and 28 $(6 + 9) \div (31 - 28)$
- one hundred times the difference of 6 and 5 $100 \times (6 - 5)$
- seventeen times the sum of 20 and 3 $17 \times (20 + 3)$

Four Fives

Can you write 10 number expressions, using only four fives, that equal the numbers 1 through 10?

$$\begin{aligned} (5+5) \div (5+5) &= 1 & (5 \div 5) + (5 \div 5) &= 2 \\ 5 - (5+5) \div 5 &= 3 & (5 \times 5 - 5) \div 5 &= 4 \\ 5 + (5-5) \div 5 &= 5 & (5 \times 5 + 5) \div 5 &= 6 \\ 5 + (5+5) \div 5 &= 7 & 8 \text{ can't be done} & \\ (5+5) - (5 \div 5) &= 9 & & \end{aligned}$$

Here's an example for 10:

$$(5 + 5) - (5 - 5) = 10$$

$$(5+5) - (5-5) = 10$$

135

Assigning the Practice

Minimum: 1-14, 21-25

Average: 7-25

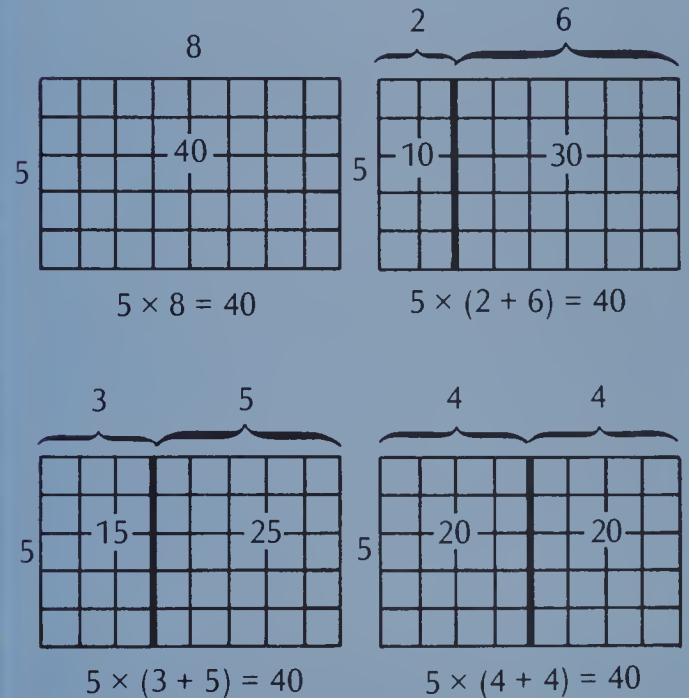
Enriched: 7-25

Reinforcement

1. Use arrays to explain why pairs of number expressions like the following are not equal.

$$\begin{aligned} \begin{array}{ccc} \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \end{array} & + 2 & = 14 \\ 3 \times 4 & + 2 & = 14 \\ \begin{array}{ccc} \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet \end{array} & (4 + 2) & = 18 \\ 3 \times & (4 + 2) & = 18 \end{aligned}$$

2. Have the students rename factors as a sum and illustrate it with rectangle area diagrams on graph paper. For example:



Rectangle area diagrams of these multiplications can be made in at least four different ways on graph paper.

- $6 \times 9 = 54$
- $8 \times 22 = 176$
- $9 \times 10 = 90$
- $9 \times 25 = 225$

Enrichment

1. Assign *Four Fives* at the bottom of page 135. Have the students try the same activity with four fours, or four sixes.

2. Ask the students to simplify these expressions.

- $6 + 9 \div (4 - 1) + 5 \times 3$
- $30 - 2 \times 4 + 6 \div (3 + 3)$
- $15 + (7 + 5) - 12 \div 4 \times 1$
- $48 - 16 \div 2 - 15 \times (8 \div 8)$

Extra Practice

Worksheet A31

Pages 134-135

Simplify the expression.

1. $200 \div (15 + 5)$ $= 200 \div 20$ $= 10$	2. $(30 - 15) \div (27 - 24)$ $= 15 \div 3$ $= 5$	3. $125 \div (21 + 4)$ $= 125 \div 25$ $= 5$	4. $(28 - 20) \times 80$ $= 8 \times 80$ $= 640$
5. $2 \times 12 \div (8 + 0)$ $= 2 \times 12 \div 8$ $= 24 \div 8$ $= 3$	6. $383 - (11 + 9) + 7$ $= 383 - 20 + 7$ $= 363 + 7$ $= 370$	7. $22 \times 2 \div 11$ $= 44 \div 11$ $= 4$	8. $3 \times 2 \times (57 - 57)$ $= 3 \times 2 \times 0$ $= 6 \times 0$ $= 0$

Write the expression and then simplify it.

- the sum of 3 and 4 divided by the sum of 2 and 5 $(3 + 4) \div (2 + 5) = 1$
- three times the difference between 10 and 13 $3 \times (13 - 10) = 9$

UNIT 6 LESSON 8

Objective A32

Understand how a number machine works; calculate the output value, given the rule.

Introducing the Lesson

Review the order of operations rules learned in Lesson 6 and 7 with examples like the following. Ask the students to explain the rule used as each step is done.

$$100 - (16 + 30) \times 2$$

Rule 2: parentheses first

$$= 100 - 46 \times 2$$

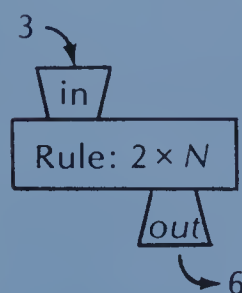
Rule 1: multiply first

$$= 100 - 92$$

$$= 8$$

Teaching the Lesson

Sketch the following number machine on the chalkboard. Tell the students that this is a doubling or multiply-by-2 machine. As the students understand how the machine works, have them complete the table.



In	Out
N	$2 \times N$
3	6
4	8
5	
6	
7	

Sketch a tripling or multiply-by-3 machine, also. Follow the same procedure as above.

Refer the students to the number machines at the top of page 136. Explain how to find the numbers to substitute for N. Show them how to rewrite each expression with the substituted number before they attempt to simplify it. Point out how the rules for order of operations are used while simplifying the expressions in the number machines.

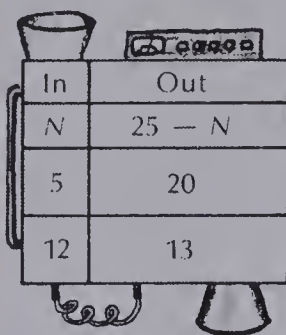
In	Out
N	$5 \times (N + 2)$
6	
10	

← Rule 2: parentheses first

In	Out
N	$3 + N \div 2$
8	
12	

← Rule 1: division first

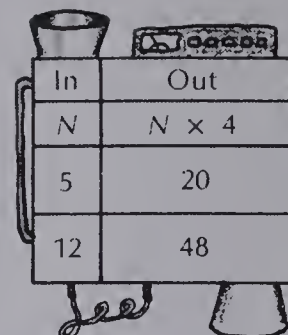
Number Machines



← Rule

$$25 - 5$$

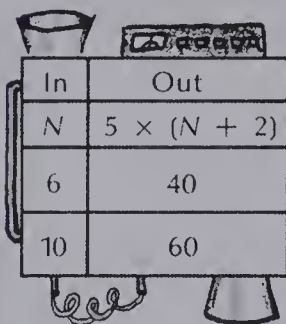
$$25 - 12$$



← Rule

$$5 \times 4$$

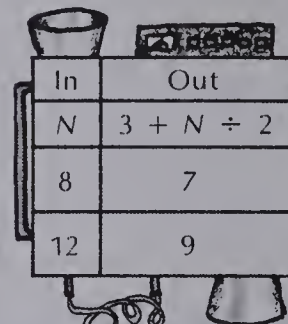
$$12 \times 4$$



← Rule

$$5 \times (6 + 2)$$

$$5 \times (10 + 2)$$



← Rule

$$3 + 8 \div 2$$

$$3 + 12 \div 2$$

EXERCISES

Copy and complete.

1.

In	Out
N	$9 + N$
6	15
8	17
100	109

2.

In	Out
N	$N - 11$
15	4
21	10
60	49

3.

In	Out
N	$7 \times N$
4	28
9	63
50	350

Copy. Use order of operations to complete these

4.

In	Out
N	$(20 - N) \times 2$
12	16
9	22
4	32

5.

In	Out
N	$(N \times 5) + 3$
6	33
9	48
20	103

6.

In	Out
N	$6 + N \div 3$
6	8
12	10
21	13

Using the Exercises

- Questions 1 to 3 involve expressions with only one operation.
- Questions 4 to 6 involve expressions with two operations.

PRACTICE

Copy and complete.

1.

In	Out
N	$15 + N$
8	23
16	31
28	43

2.

In	Out
N	$38 - N$
11	27
17	21
29	9

3.

In	Out
N	$N \times 8$
5	40
12	96
30	240

4.

In	Out
N	$N \div 6$
24	4
42	7
540	90

5.

In	Out
N	$52 - N$
9	43
18	34
29	23

6.

In	Out
N	$60 \div N$
2	30
4	15
5	12

Copy. Use order of operations to complete these.

7.

In	Out
N	$(N + 3) \times 6$
2	30
5	48
8	66

8.

In	Out
N	$5 \times N - 4$
6	26
9	41
20	96

9.

In	Out
N	$(N + 9) \times 7$
1	70
2	77
11	140

10.

In	Out
N	$48 \div (N + 3)$
3	8
5	6
9	4

11.

In	Out
N	$N \times 4 \div 2$
8	16
20	40
60	120






12.

In	Out
N	$(N \div 5) + 3$
15	6
40	11
100	23

Roman Numerals

I = 1 V = 5 X = 10 L = 50 C = 100 D = 500 M = 1000

Write these Roman numerals in standard form.

a.  27 b.  160 c.  19 d.  458 e.  2142

Assigning the Practice

Minimum: 1-12

Average: 1-12

Enriched: 1-12

Reinforcement

1. Have the students make up three number machines, each with a different rule, and exchange the machines with a partner who finds the output values.

2. Ask the students to write the rule for these number machines.

In	Out
N	?
1	3
2	6
3	9
4	12
5	15

In	Out
N	?
1	0
2	1
3	2
4	3
5	4

In	Out
N	?
10	110
11	121
12	132
13	143
14	154

In	Out
N	?
45	9
50	10
55	11
60	12
65	13

Enrichment

1. Before assigning Roman Numerals at the bottom of page 137, review the symbols.

2. Have the students write a rule after they complete each pattern.

- (1, 3) (2, 6) (3, 9) (4, ■) (5, ■) (6, ■) (■, 21)
- (1, 10) (2, 11) (3, 12) (4, ■) (5, ■) (■, 15) (■, ■)
- (10, 5) (12, 6) (14, 7) (16, ■) (18, ■) (■, 10) (■, ■)

2. Play this number guessing game. Discuss why everyone has the same result.

- Think of a number.
- Multiply it by 2.
- Add 6.
- Subtract 2.
- Divide by 2.
- Subtract your original number.
- Is your answer 2?

Extra Practice

Complete.

1.

In	Out
N	$18 - N$
2	16
12	6
15	3

2.

In	Out
N	$N \times 6$
3	18
7	42
21	126

3.

In	Out
N	$N \div 3$
18	6
36	12
81	27

4.

In	Out
N	$73 + N$
73	146
27	100
101	174

5.

In	Out
N	$16 - (N - 1)$
16	1
1	16
15	2

6.

In	Out
N	$60 \div (5 + N)$
5	6
10	4
25	2

Worksheet A32

Pages 136-137

UNIT 6 LESSON 9

Objective A33

Solve simple equations.

Introducing the Lesson

Review the notion of **opposite operations**. What addition does can be *undone* by subtraction: $16 + 9 = 25$ and $25 - 9 = 16$. Thus, addition and subtraction are opposite operations. Similarly, multiplication and division are opposite operations: $56 \div 8 = 7$ and $7 \times 8 = 56$. Challenge students to offer other specific examples.

Teaching the Lesson

Alternative approaches to solving simple equations are outlined in the Reinforcement and Enrichment sections on page 139.

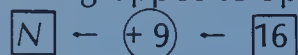
Refer students to the equation at the top of page 138. Carefully explain the thinking process of solving for N .

1. Discuss how $N - 9 = 16$ can be interpreted as: "Some number N minus 9 equals 16." Solving the equation means finding a specific number that makes this statement true.

2. The statement of the equation is translated into a flow chart:



3. An **opposite flow chart** is found by changing the direction of the flow chart and using opposite operations.



4. The opposite flow chart is read as "16 plus 9 equals some number N ." Compare this statement with the original statement above in Step 1.

5. The equation associated with the opposite flow chart and statement is $16 + 9 = N$. This is the **opposite equation** of $N - 9 = 16$. Recall how $N - 9 = 16$ and $16 + 9 = N$ demonstrate that subtraction and addition are opposite operations.

6. $N = 25$ since $16 + 9 = N$. Check the solution by substituting N with 25 in the original equation.

$$N - 9 = 16$$

$$25 - 9 = 16 \quad \text{YES}$$

Solving Equations

$N - 9 = 16$ is an equation. It is read as: "Some number minus 9 equals 16."

$$N - 9 = 16$$

Use the **opposite flowchart** to find the **opposite equation**

$$N + 9 = 16$$

$16 + 9 = N$ is the opposite equation of $N - 9 = 16$

$$N = 25$$

25 solves the equation $N - 9 = 16$

To check, replace N with 25: $25 - 9 = 16$.

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opposite operations

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EXERCISES

Find the opposite flowchart and opposite equation. Solve the equation. Check the solution.

1. $6 + N = 11$

$$N + 6 = 11$$

$$N = 5$$

3. $N - 17 = 12$

$$N - 17 = 12$$

$$N = 29$$

5. $N \times 6 = 90$ $N = 15$

7. $9 + N = 32$ $N = 23$

2. $N \div 2 = 12$

$$N \div 2 = 12$$

$$N = 24$$

4. $9 \times N = 108$

$$N \times 9 = 108$$

$$N = 12$$

6. $N \div 8 = 4$ $N = 32$

8. $7 \times N = 56$ $N = 8$

138

Using the Exercises

- The students' work on page 138 should include the equation, the flow chart, the opposite flow chart, the opposite equation, the solution, and the check of the solution.

For example:

$$N + 6 = 11 \quad N \rightarrow (+6) \rightarrow 11 \quad N \leftarrow (-6) \leftarrow 11 \quad 11 - 6 = N$$

$$\text{Solution: } N = 5 \quad \text{Check: } 5 + 6 = 11$$

- For the problems on page 139, allow students to abbreviate the process to highlight the opposite operations being used. For example: $N + 6 = 11$, $11 - 6 = N$, so $N = 5$. Check $5 + 6 = 11$.

Explain these steps in solving several other equations: $23 + N = 51$, $N \div 8 = 56$ and $N \times 3 = 21$. (This method is not easy to apply to equations containing either $-N$ or $\div N$ since the flow chart must start with N . See the discussion on page 139.)

PRACTICE

Solve. Check.

1. $8 + N = 71$ $N=63$
2. $N - 28 = 4$ $N=32$
3. $N \times 3 = 36$ $N=12$
4. $N \div 9 = 8$ $N=72$
5. $N - 45 = 29$ $N=74$
6. $N \div 8 = 6$ $N=48$
7. $62 + N = 80$ $N=18$
8. $30 \times N = 150$ $N=5$
9. $N \div 4 = 25$ $N=100$
10. $N - 85 = 17$ $N=102$
11. $18 + N = 92$ $N=74$
12. $N \times 12 = 24$ $N=2$

Solve the equations to decode a message below.

13. $20 \times \boxed{E} = 60$
14. $27 + \boxed{I} = 104$
15. $\boxed{Q} - 19 = 27$
16. $\boxed{A} \div 3 = 47$
17. $\boxed{N} \times 56 = 504$
18. $25 \times \boxed{U} = 200$
19. $15 \times \boxed{U} = 120$
20. $\boxed{O} \div 9 = 25$
21. $\boxed{S} \times 99 = 198$
22. $\boxed{T} - 85 = 102$
23. $\boxed{E} \times 51 = 153$
24. $\boxed{R} \div 32 = 8$
25. $\boxed{N} + 195 = 204$
26. $\boxed{F} - 75 = 113$
27. $\boxed{A} - 58 = 83$

E Q U A T I O N S A R E F U N

3 46 8 141 187 77 225 9 2 141 256 3 188 8 9 !

Write the equation. Solve.

28. A number divided by 11 equals 12. $N \div 11 = 12$ $N=132$
29. 18 times a number equals 90. $18 \times N = 90$ $N=5$
30. A number minus 47 equals 48. $N - 47 = 48$ $N=95$
31. 235 plus a number equals 604. $235 + N = 604$ $N=369$

Squares and Odds

Copy and fill in the missing numbers.

You will see how the square numbers and odd numbers are related.

$1^2 = 1$	○	○	○	○	○
$2^2 = 1 + \blacksquare 3$	○	○	○	○	○
$3^2 = 1 + 3 + \blacksquare 5$	○	○	○	○	○
$4^2 = 1 + 3 + 5 + \blacksquare 7$	○	○	○	○	○
$5^2 = 1 + \blacksquare + \blacksquare + \blacksquare + \blacksquare$	○	○	○	○	○
	3	5	7	9	

Try to go to 10.

139

Assigning the Practice

Minimum: 1-27

Average: 5-31

Enriched: 5-31

Reinforcement

1. Demonstrate the **guess and test** strategy for finding the solution of the equation $38 + N = 55$. Record the guesses of students in a chart similar to those found on the previous lesson. Encourage students to make guesses without fear of being incorrect: "That's what guess and test means. You're not supposed to guess the answer on the first try."

N	$38 + N$	55	
21	59	55	not equal, guess lower
16	54	55	not equal, guess higher
17	55	55	equal

$N = 17$

2. Give each student four strips of cardboard on which to write horizontally four equations, one equation for each of the four operations. Ask students to obliterate one number in each equation. Have the students exchange their cards and solve their neighbours equations.

$\blacksquare - 34 = 62$

front

$96 - 34 = 62$

back

Enrichment

1. Assign *Squares and Odds* at the bottom of page 139.

2. Ask the students to write as many equations using 54, 9 and N as they can.

3. Demonstrate the *balancing* strategy for finding the solution of the equation $N \times 6 = 486$ and $N + 17 = 92$. Compare this method to the use of a pan balance. To maintain a balanced situation, what is done to one side must also be done to the other side. To solve an equation, one isolates the unknown N by applying an opposite operation to both sides of the equation.

$$\begin{array}{r} N \times 6 = 486 \\ \div 6 \quad \div 6 \\ \hline N = 81 \end{array}$$

$N = 81$

$$\begin{array}{r} N + 17 = 92 \\ - 17 \quad - 17 \\ \hline N = 75 \end{array}$$

$N = 75$

Extra Practice

Worksheet A33

Pages 138-139

Solve the equation. Check.

1. $N - 20 = 6$ $6 + 20 = N$ $26 = N$	2. $N \div 4 = 15$ $15 \times 4 = N$ $60 = N$	3. $N + 23 = 34$ $34 - 23 = N$ $11 = N$	4. $N \times 6 = 72$ $72 \div 6 = N$ $12 = N$
5. $N \div 3 = 27$ $27 \times 3 = N$ $81 = N$	6. $N - 40 = 30$ $30 + 40 = N$ $70 = N$	7. $N \times 62 = 186$ $186 \div 62 = N$ $3 = N$	8. $N + 72 = 185$ $185 - 72 = N$ $113 = N$

Write the equation. Solve.

9. a number multiplied by 3 equals 57 $N \times 3 = 57$ $N=57 \div 3$ $N=19$
10. a number minus 17 equals 84 $N - 17 = 84$ $N=84 + 17$ $N=101$

UNIT 6 LESSON 10

Objective PS5

Write an equation for a word problem.

Introducing the Lesson

Review the procedure for solving equations learned in Lesson 9. Show how the steps can be condensed to the following example at the right.

$$\begin{array}{lcl}
 N + 34 = 191 & N + 34 = 191 & \\
 \boxed{N} \rightarrow \boxed{+ 34} \rightarrow \boxed{191} & N = 191 - 34 & \\
 \boxed{N} \rightarrow \boxed{- 34} \rightarrow \boxed{191} & N = 157 & \\
 191 - 34 = N & \text{Check: } 157 + 34 = 191 & \\
 N = 157 & & \\
 \text{Check: } 157 + 34 = 191 & &
 \end{array}$$

Point out how the equation is solved by doing the opposite of + 34.

Teaching the Lesson

Write the following on the chalkboard: \$3.60, \$1.20, and N . Ask the students to make up a simple word problem using these three items. As different word problems are given, write them on the chalkboard and have the students identify their facts and then think of the equation that relates to each problem. For example:

\$3.60 spent. \$1.20 left.
How much at first?
 $N - \$3.60 = \1.20

Books are \$1.20 each.
\$3.60 will buy exactly how many?
 $\$3.60 \div N = \1.20

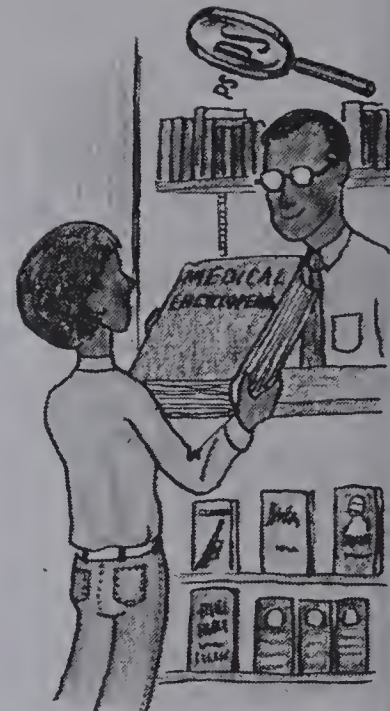
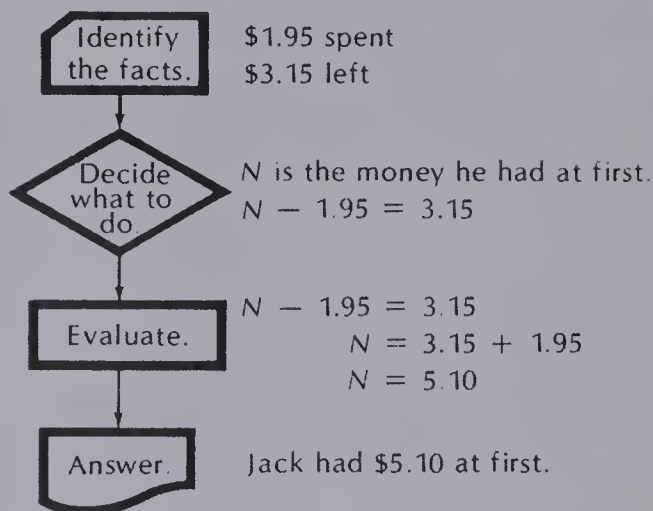
If the situation occurs where the unknown is not *written first* in the equation ($\$3.60 \div N = \1.20), explain that it is best to solve the equation with the unknown written first. Show how the *opposite equation* can be written to clarify such a situation before solving for N .

$$\begin{array}{l}
 \$3.60 \div N = \$1.20 \\
 N \times \$1.20 = \$3.60
 \end{array}$$

Read and discuss the problem at the top of page 140. Explain how the equation was developed and the condensed procedure for solving the problem. Give the students practice with several other similar word problems. Encourage the checking of results.

Equations

Jack bought a book for \$1.95. He had \$3.15 left to spend. How much did he have at first?



EXERCISES

Write an equation for each situation.

- N dollars are in the bank. \$550 is deposited. Now there is \$850 in the bank. $N + \$550 = \850
- Tim had N pencils. Then 3 were lost. Now 4 are left. $N - 3 = 4$
- In Mrs. Bodner's class there are 18 girls and N boys. There are 39 children altogether. $N + 18 = 39$
- There are 10 floors in a building with N apartments on each floor. The building has 50 apartments in all. $N \times 10 = 50$
- A store had N quartz watches at the beginning of a one day sale. Seven watches were sold and 5 watches are left. $N - 7 = 5$
- When 15 is subtracted from a number, the result is 37. $N - 15 = 37$
- Twenty-six times N is 364. $N \times 26 = 364$
- A number divided by 3 is 17. $N \div 3 = 17$

Using the Exercises

- Questions 1 to 8 involve the writing of an equation from a given situation. The point here is the writing of the correct equation. Solving the equation is not required, but can be done by the class for further practice.

PRACTICE

Write an equation for each and solve it.

- At the book fair, Meegan bought 12 paperbacks. Eight of these were mysteries and the rest were science fiction. How many were science fiction?
 $N + 8 = 12$
 $N = 4$
- A fee of 25¢ per day is charged for overdue library books. If Tom paid \$1.50, how many days was his book overdue?
 $N \times 25 = 150$ $N = 6$
- Twelve more than a certain number is equal to 56. What is the number?
 $N + 12 = 56$
 $N = 44$
- Fifty-six is 12 more than what number?
 $N + 12 = 56$ $N = 44$
- What number added to 35 gives 49?
 $N + 35 = 49$ $N = 14$
- Nine subtracted from what number gives 56?
 $N - 9 = 56$ $N = 64$
- What number when divided by 6 gives 15?
 $N \div 6 = 15$ $N = 90$
- Seven times what number is 210?
 $N \times 7 = 210$ $N = 30$

REVIEW

A30 Copy and simplify each expression.

- $17 - 8 \times 2$ 1
- $50 + 8 \div 2 - 10$ 44

- $(21 \div 3) + (6 \times 7)$ 49
- $46 \times (98 - 98)$ 0

Copy and complete.

A32	5.	In	Out	6.	In	Out	7.	In	Out
		N	$75 - N$		N	$48 \div (N \times 2)$		N	$80 - N \times 5$
		29	46		8	3		6	50
		17	58		12	2		12	20
		36	39		24	1		16	0

A33 Solve for N. Check.

- $N - 45 = 27$ $N = 72$
- $N \div 8 = 11$ $N = 88$
- $64 + N = 100$ $N = 36$

141

Assigning the Practice

Minimum: 1-8

Average: 1-8

Enriched: 1-8

Review Exercises

Questions	Objectives	Pages
1-2	A30	132-133
3-4	A31	134-135
5-7	A32	136-137
8-10	A33	138-139

Reinforcement

1. Have each student make up a simple equation (with N) on a card. Number the cards. Give each student an answer sheet. At a signal, ask each student to pass his or her equation card to the person on the right. Each student solves the equation and then checks the answer off on his or her answer sheet. At another signal, the cards are passed again, equations solved, and answers checked off. Repeat until the cards have been all around the group. Check the results.

2. Have the students write the *opposite equation* for each. For example, for the equation $48 - N = 19$, the opposite equation is $19 + N = 48$. Some students may need to write the *opposite flow-chart* first as was done in Lesson 9.

- $N \times 64 = 128$
- $72 \div N = 8$
- $N + 86 = 150$
- $N - 92 = 83$
- $N \times 22 = 264$

Enrichment

Ask the students to write the following equations in words (as in Practice questions 7 and 8 on page 141).

- $15 \times N = 150$
- $75 \div N = 15$
- $N \div 8 = 40$
- $N \times 16 = 144$
- $2 \times N + 3 = 23$
- $N \div 2 + 5 = 48$

Have the students make up a word problem for each of the above equations.

Problem Solving Activities

Assign Level 6, Unit 6

Extra Practice

Worksheet PS5

Pages 140-141

Write an equation for each and solve.

- Ronald's height plus 10 cm is Gary's height. If Gary is 128 cm tall, how tall is Ronald?
 $N + 10 = 128$ $N = 128 - 10$
 $= 118 \text{ cm}$
- Edna earns \$1.50 an hour for babysitting. She earned \$7.50 on Friday evening. How many hours did she babysit?
 $N \times 1.5 = 7.50$
 $N = 7.50 \div 1.5 = 5 \text{ h}$
- Thirty more than a number is equal to 40. What is the number?
 $N + 30 = 40$ $N = 40 - 30$ $N = 10$
- When 75 is subtracted from a number, the result is 37. What is the number?
 $N - 75 = 37$ $N = 37 + 75$ $N = 112$
- Eight times what number is 160?
 $N \times 8 = 160$ $N = 160 \div 8$ $N = 20$
- What number divided by 18 gives 5?
 $N \div 18 = 5$ $N = 5 \times 18$ $N = 90$
- Twelve less than a number is 13. What is the number?
 $N - 12 = 13$ $N = 13 + 12$ $N = 25$

Unit 6 Objective	Test Questions	Pages
A25	1-3	122-123
A26	4-13	124-125
A27	14-16	126-127
A28	17-21	128-129
A29	22-26	130-131
A30	27-28	132-133
A31	29-30	134-135
A32	34-36	136-137
A33	31-33	138-139

TEST

UNIT 6

List the multiples for each. Find the LCM.

1. 6 and 9

LCM: 18

2. 6 and 8

LCM: 24

3. 12 and 16

LCM: 48

Is 2314 divisible by:

4. 10? No

5. 2? Yes

6. 3? No

7. 4? No

8. 9? No

Is 708 divisible by:

9. 10? No

10. 2? Yes

11. 3? Yes

12. 4? Yes

13. 5? No

List the factors for each. Find the GCF.

14. 15 and 30

GCF: 15

15. 28 and 35

16. 26 and 39

GCF: 13

15: 1, 3, 5, 15

28: 1, 2, 4, 7, 14, 28

26: 1, 2, 13, 26

Write prime or composite.

35: 1, 5, 7, 35

GCF: 7

39: 1, 3, 13, 39

17. 12

C

18. 13

P

19. 51

C

20. 52

C

21. 83

P

Make a factor tree to express each number as a product of prime factors. Write the product using exponents.

22. 28

$2^2 \times 7$

23. 36

$2^2 \times 3^2$

24. 200

$2^3 \times 5^2$

25. 300

$2^2 \times 3 \times 5^2$

26. 108

$2^2 \times 3^3$

Copy and simplify each expression.

27. $40 + 9 \times 5$

85

28. $33 - 12 + 10 \div 2$

26

29. $92 \div (6 - 4)$

46

30. $(7 + 2) \div (19 - 16)$

3

Solve for N. Check.

31. $N - 100 = 37$

$N = 137$

32. $N \div 25 = 8$

$N = 200$

33. $6 \times N = 90$

$N = 15$

Copy and complete.

34.

In	Out
N	$86 + N$
9	95
26	112
104	190

35.

In	Out
N	$48 \div (N \times 2)$
3	8
6	4
8	3

36.

In	Out
N	$16 + N \div 5$
10	18
25	21
40	24

Post-test

Unit

List the multiples for each. Find the LCM.

1. 6 and 10

6: 6, 12, 18, 24, 30
10: 10, 20, 30

2. 2 and 3

2: 2, 4, 6, 8
3: 3, 6, 9

3. 15 and 20

15: 15, 30, 45, 60

20: 20, 40, 60

Is 140 divisible by:

4. 2? Yes

5. 3? No

6. 5? Yes

7. 6? No

8. 10? Yes

Is 2142 divisible by:

9. 2? Yes

10. 3? Yes

11. 4? No

12. 5? No

13. 9? Yes

List the factors for each. Find the GCF.

14. 16 and 20

16: 1, 2, 4, 8, 16

15. 20 and 75

20: 1, 2, 4, 5, 10, 20

16. 16 and 32

16: 1, 2, 4, 8, 16

Write prime or composite.

75: 1, 3, 5, 15, 25, 75

32: 1, 2, 4, 8, 16

17. 10

Composite

18. 19

Prime

19. 22

Composite

20. 43

Prime

21. 77

Composite

Make a factor tree to express each number as a product of prime factors. Write the product using exponents.

22. 20

$2^2 \times 5$

23. 48

$2^4 \times 3$

24. 90

$2 \times 3^2 \times 5$

25. 175

$5^2 \times 7$

26. 360

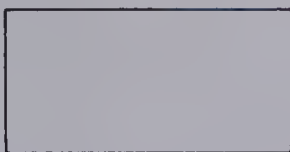
$2^3 \times 3^2 \times 5$

What is the best unit of length for measuring each object?

1. thickness of a book **mm**
2. width of a book cover **cm**
3. height of a tree **m**
4. length of a bus trip **km**

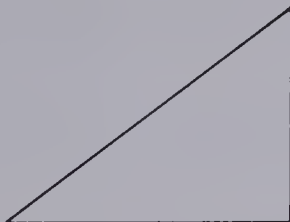
Answer the questions for the rectangle shown.

5. Measure the length. **4 cm**
6. Measure the width. **2 cm**
7. What is the area? **8 cm²**



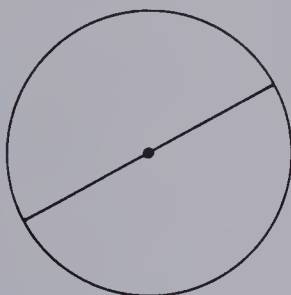
Answer these questions for the triangle.

8. Measure the base. **4 cm**
9. Measure the height. **3 cm**
10. What is the area? **6 cm²**

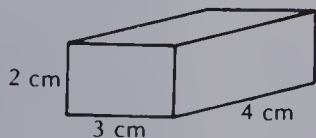


Answer these questions for the circle. (Pi = 3.14)

11. Measure the diameter. **4 cm**
12. What is the radius? **2 cm**
13. What is the circumference? **12.56 cm**
14. What is the area? **12.56 cm²**



15. Calculate the volume of the box.



$$V = 2 \times 3 \times 4 \text{ cm}^3 = 24 \text{ cm}^3$$

Copy and complete.

16. 3 kg = g **3000**
17. 6000 kg = t **6**
18. 2.5 t = kg **2500**
19. 8 L = mL **8000**
20. 2500 mL = L **2.5**
21. 5000 L = kL **5**
22. John started reading at 10:45. He had to stop at 13:15 to run an errand for his mother. For how long did he read? **2 h 30 min**

Simplify each expression.

7. $50 - 40 \div 8$ **45**
28. $21 - 8 \times 2 + 4$ **9**
9. $(6 + 7) \times 3$ **39**
30. $(39 - 19) \times (11 + 9)$ **400**

Solve for N. Check.

1. $N + 112 = 217$
105
32. $N \div 16 = 35$
560
33. $42 \times N = 630$
15

Complete.

In	Out
N	$32 - N$
2	30
10	22
12	20

In	Out
N	$5 \times (N + 2)$
3	25
8	50
10	60

In	Out
N	$9 + N \div 3$
3	10
12	13
27	18

UNIT 7

Fractions

Theme: Music

Lesson		Objective	Pages
Preview		Review the factors of a number.	145
1	N11	Identify the numerator and the denominator of a fraction.	146-147
2	A34	Write equivalent fractions.	148-149
3	A35	Write the simplest form of a fraction.	150-151
4	N12	Compare fractions.	152-153
5	N13	Write mixed numerals as fractions.	154-155
6	N14	Write fractions as mixed numerals.	156-157
7	A36	Write fractions as decimals.	158-159
8	A37	Find the fractional part of a set using a unit fraction.	160-161
9	A38	Find the fractional part of a set using more than a unit fraction.	162-163
10	PS6	Identify extraneous information and insufficient information in word problems.	164-165
Test		Fractions	166
Review		Number Theory	167

About This Unit

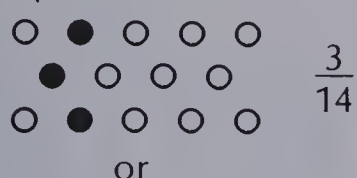
Fractional numbers are the only extension of whole numbers treated extensively in the elementary grades. They were probably first used in simple measurement situations. Today they are still used in measurement and in other areas such as music (half notes, quarter notes), time ($\frac{3}{4}$ of an hour), and sports (halftime).

Students will be using fractions in a variety of ways in this unit.

a. as part of a whole



b. as part of a set



or



c. as a decimal



d. as being equal to other fractions

$$\frac{2 \times 5}{3 \times 5} = \frac{10}{15}$$

$$\frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

e. as being greater or lesser than other fractions

$$\frac{3}{4} > \frac{5}{8} \text{ because } \frac{3 \times 2}{4 \times 2} = \frac{6}{8}$$

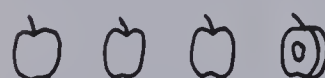
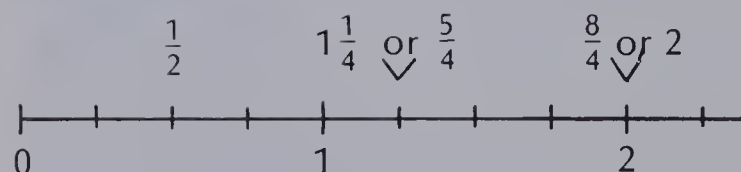
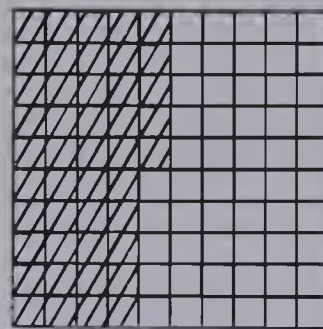
f. as representing amounts greater than one whole

$$\frac{19}{9} = 2\frac{1}{9}$$

For maximum benefit, the lessons should be studied in the order given. The many suggested uses of manipulative devices are very important to help the students internalize the concepts.

Ideas

The concept and operations of fractions often give students difficulties. Hence, it is suggested that a variety of models be used to illustrate the meaning and operations of fractions.



$$3 + \frac{1}{2} = 3\frac{1}{2}$$

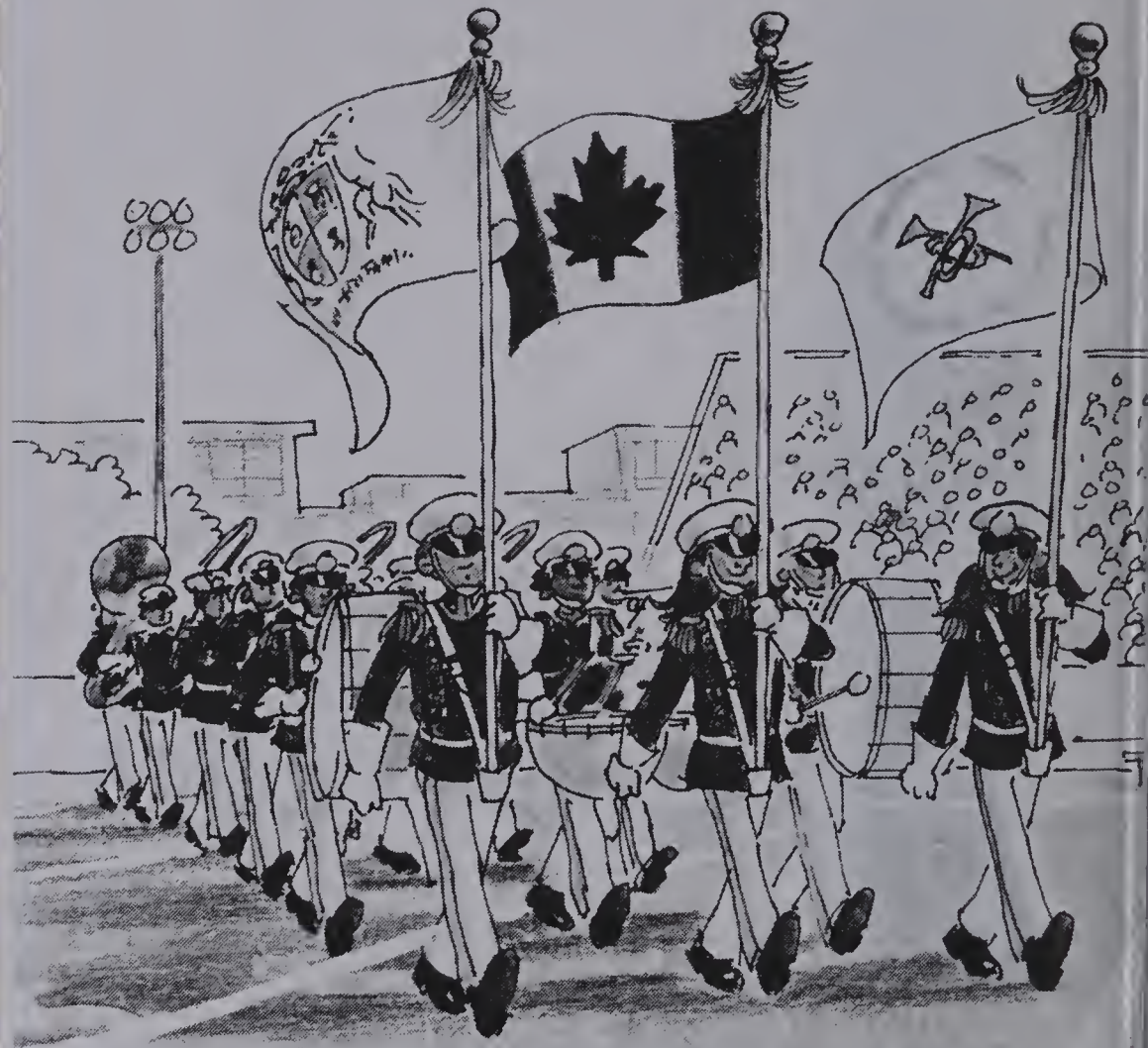


$$\frac{2}{2} + \frac{2}{2} + \frac{2}{2} + \frac{1}{2} = \frac{7}{2}$$

$$3\frac{1}{2} = \frac{7}{2}$$

UNIT 7

FRACTIONS



Unit 7 Objective	Test Questions	Pages
N11	1-3	146-147
A34	4-7	148-149
A35	8-12	150-151
N12	13-16	152-153
N13	17-21	154-155
N14	22-26	156-157
A36	27-31	158-159
A37	32-35	160-161
A38	36-39	162-163
PS	40	164-165

Pretest

Unit 7

What fraction of the set is shaded?



Write the missing numerator or denominator.

4. $\frac{1}{4} = \frac{4}{16}$

5. $\frac{2}{3} = \frac{10}{15}$

6. $\frac{5}{6} = \frac{15}{18}$

7. $\frac{2}{9} = \frac{6}{27}$

Write in simplest terms.

8. $\frac{4}{10} = \frac{2}{5}$

9. $\frac{3}{12} = \frac{1}{4}$

10. $\frac{15}{18} = \frac{5}{6}$

11. $\frac{20}{40} = \frac{1}{2}$

12. $\frac{21}{49} = \frac{3}{7}$

Compare using < or >.

13. $\frac{1}{3} < \frac{4}{9}$

14. $\frac{3}{7} > \frac{6}{21}$

15. $\frac{7}{8} < \frac{43}{48}$

16. $\frac{11}{24} > \frac{5}{12}$

Change the mixed numeral to a fraction.

17. $1\frac{1}{3} = \frac{4}{3}$

18. $3\frac{2}{5} = \frac{17}{5}$

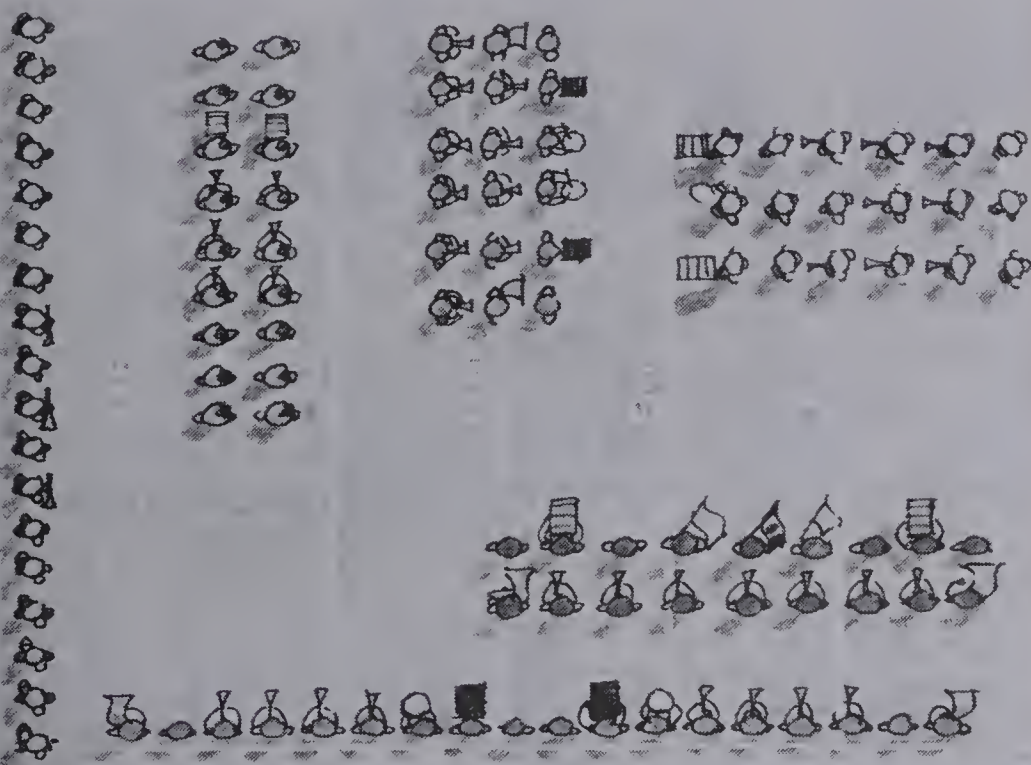
19. $5\frac{3}{4} = \frac{23}{4}$

20. $4\frac{1}{6} = \frac{25}{6}$

21. $2\frac{3}{8} = \frac{19}{8}$

Forward, March!

During the football half-time show, six school bands marched on the field in different formations. There were 18 members in each band.



- Write 18 as the product of a pair of factors for each formation. $1 \times 18, 2 \times 9$
- What rectangular formations can be made by 36 members? $3 \times 6, 9 \times 2$
 $1 \times 36, 2 \times 18, 3 \times 12, 4 \times 9, 6 \times 6, 9 \times 4, 12 \times 3, 36 \times 1$
- How many formations can be made by only 9 players? $6 \times 3, 18 \times 1$
- Complete the table below to predict how many formations can be made by 72 players and 144 players. Check your predictions by listing all the pairs of factors.

Players	9	18	36	72	144
Formations	3?	6	9?	12?	15?

145

UNIT 7

PREVIEW

Suggestions

Give each student a sheet of dot paper. Ask them to circle as many rectangular arrangements of 18 dots as they can.

Look at the formations of 18 band members on page 145. Did the rectangular arrangements the students made on dot paper agree with those shown? What is the probable rectangular formation of band members on page 144?

Have the students use the rectangular formations for 18 to list the factors of 18: 1, 2, 3, 6, 9, 18.

Ask the students to circle 24 band members on their dot paper in as many rectangular formations as possible. Then have them list the factors of 24.

Repeat the same procedure for 23 and 32 band members.

About the Page

The four questions asked at the bottom of the page are a review of factors and multiplication. These skills are important for working with fractions.

Have available extra sheets of dot paper for students who might need it as they answer the questions.

Reinforcement

Ask the students to make rectangular arrangements on dot paper to show:

- ten numbers having only two arrangements.
- five numbers having only three arrangements.
- five numbers having only four arrangements.

Then have the students list the factors of these numbers and tell whether they are *prime* or *composite*.

Change the fraction to a mixed numeral.

22. $\frac{5}{2}$ $2\frac{1}{2}$ 23. $\frac{10}{8}$ $1\frac{5}{4}$ 24. $\frac{13}{4}$ $3\frac{1}{4}$ 25. $\frac{25}{5}$ 5 26. $\frac{38}{9}$ $4\frac{2}{9}$

Write as a decimal.

27. $\frac{9}{10}$ 0.9 28. $\frac{31}{100}$ 0.31 29. $\frac{7}{25}$ 0.28 30. $\frac{29}{50}$ 0.58 31. $\frac{5}{8}$ 0.625

Multiply.

32. $\frac{1}{5} \times 20$ 4 33. $\frac{1}{3} \times 33$ 11 34. $\frac{1}{4} \times 28$ 7 35. $\frac{1}{8} \times 40$ 5
36. $\frac{2}{3} \times 9$ 6 37. $\frac{2}{5} \times 30$ 12 38. $\frac{7}{8} \times 40$ 35 39. $\frac{4}{9} \times 18$ 8

Solve

40. Alice has read 42 of the fiction books and 17 of the biographies in her classroom. If there are 75 fiction books, what fraction of them has she read?

$$\frac{59}{75}$$

Objective N11

Identify the numerator and the denominator of a fraction.

Introducing the Lesson

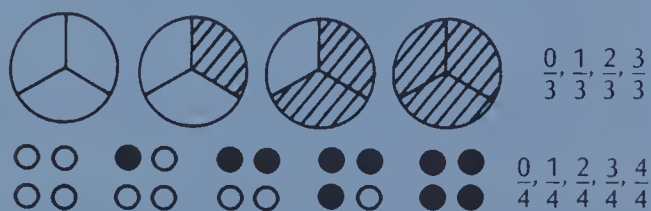
Discuss with the students how mathematics is used in music, for example, the number of half notes, quarter notes, and whole notes in a measure. Have the students identify mathematical terms used in music (lines, eight notes in an octave, quarter rest, half rest, etc.).

Teaching the Lesson

Read and discuss the top of page 146. Point out that two types of fraction models are shown. The shaded part of the drum represents a fractional part of a whole. The three trumpet players in the set of brass players represent a fractional part of a set. Explain the meaning of the terms *numerator* and *denominator* as you discuss these two fraction models.

part of a whole part of a set
 $\frac{1}{3}$ ← numerator (parts considered) → $\frac{3}{5}$
 $\frac{1}{3}$ ← denominator (parts in all) → $\frac{3}{5}$

Sketch on the chalkboard several illustrations of fractional parts of a whole and of a set. Ask the students to identify the number of parts shaded or considered, the number of parts in all, and then write the fraction. Have the students also identify *fraction families*.



Explain, for example, that 0 out of 4, or $\frac{0}{4}$, is equal to no parts or 0, and that 4 out of 4, or $\frac{4}{4}$, is equal to one whole or 1.

Have the students come to the chalkboard and illustrate fractions and fraction families. Encourage them to use both types of fraction models: part of a whole and part of a set.

Fractions



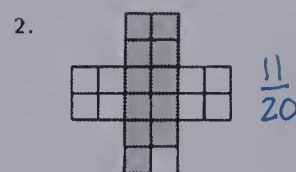
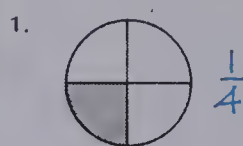
$\frac{1}{3}$ of the drum is blue.

3 of the 5 brass players play trumpets.

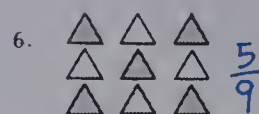
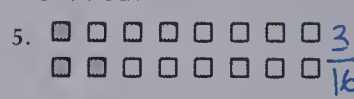
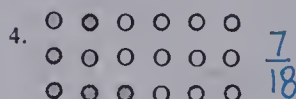
$\frac{1 \text{ blue part}}{3 \text{ parts in all}}$	$\frac{1}{3}$	numerator	$\frac{3}{5}$	$\frac{3 \text{ trumpet players}}{5 \text{ brass players}}$
		denominator		

EXERCISES

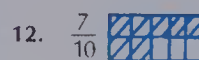
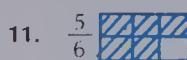
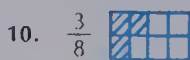
What fraction of the figure is shaded?



What fraction of the set is shaded?



Draw a rectangle and shade it to show the fraction.



Using the Exercises

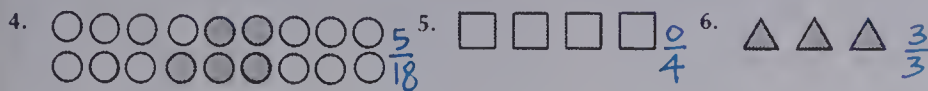
- Questions 1 to 9 require the students to write a fraction from the illustration. The first three questions involve fractional parts of a whole. The rest involve fractional parts of a set. Pay particular attention to questions 8 and 9 in which either no parts or all parts are shaded.
- For questions 10 to 14, the students must make their own illustrations of fractions. To encourage the use of *equal* fractional parts, provide graph paper.

PRACTICE

What fraction of the figure is shaded?



What fraction of the set is shaded?



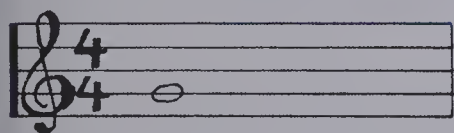
What fraction of the piano keys shown in the figure is black?



Draw a rectangle and shade it to show the fraction.



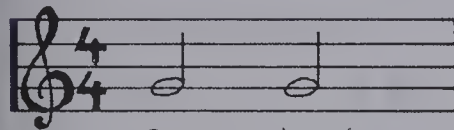
Take Note!



Whole note

One whole note has the same time value as:

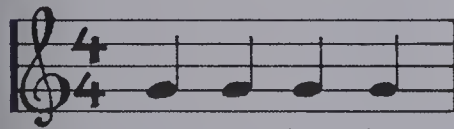
- how many half notes? 2
- how many quarter notes? 4
- how many eighth notes? 8



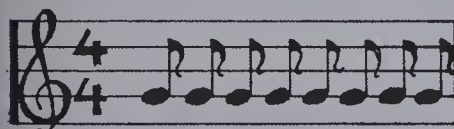
Half notes

One half note has the same time value as:

- how many quarter notes? 2
- how many eighth notes? 4



Quarter notes



Eighth notes

* Note:

2 black keys out of 5 keys. Here we are counting "objects" in a set, not area. 147

Assigning the Practice

Minimum: 1-14

Average: 1-14

Enriched: 1-14

Reinforcement

1. Represent each of the following fractions with a drawing of a rectangle, square, circle, and a set of stars.

$$\frac{1}{2}, \frac{3}{4}, \frac{2}{3}, \frac{5}{8}, \frac{10}{10}, \frac{0}{6}$$

2. Ask the students to survey their classmates for various kinds of information. Then have them prepare a chart for display that lists the fractional parts of the set of classmates to which this information applies. For example:

- $\frac{21}{32}$ students ride bicycles to school.
- $\frac{3}{32}$ students have red hair.
- $\frac{15}{32}$ students wear glasses.
- $\frac{0}{32}$ students read the newspaper every day.

3. Have the students flip a coin 6, 12, 18, and 24 times and record a fraction for the number of times heads turns up.

$\frac{3}{6}$ heads turned up
6 flips in all

Enrichment

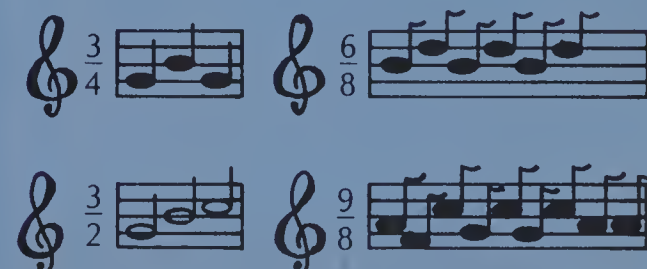
1. Assign *Take Note!* at the bottom of page 147.

2. Give the students a sheet of number lines showing the space between 0 and 1 and a ruler. Have them measure and mark equal intervals on the number line as they illustrate these fractions.

$$\frac{3}{5}, \frac{7}{8}, \frac{0}{10}, \frac{1}{3}, \frac{6}{6}, \frac{3}{4}$$



3. What do the following numbers mean in music?



Extra Practice

Worksheet N11

Pages 146-147

Write a fraction for each.



9. six out of fifteen boys $\frac{6}{15}$

10. three errors in ten problems $\frac{3}{10}$

11. two months of a year $\frac{2}{12}$

12. eight hours in a day $\frac{8}{24}$

Make a drawing for each fraction.



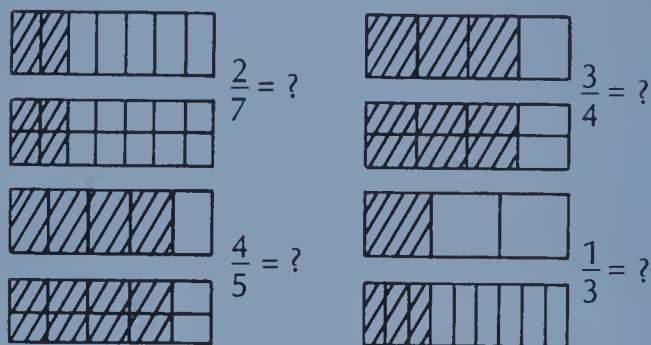
UNIT 7 LESSON 2

Objective A34

Write equivalent fractions.

Introducing the Lesson

Show the following illustrations. Ask the students to study them and then name an equivalent fraction.



Teaching the Lesson

Explain that equivalent fractions also can be found without illustrations. Ask the students to look at the first pair of equivalent fractions they have just made. What was done to the numerator, 2, to become 4 and what happened to the denominator, 7, to become 14?

$$\frac{2}{7} \rightarrow \frac{4}{14} \rightarrow \frac{2 \times 2}{7 \times 2} = \frac{4}{14}$$

The students should conclude that both numerator and denominator were multiplied by 2.

Read and discuss the lesson example at the top of page 148. Have the students find fractions equivalent to the following by using the multiplying rule given.

$$\frac{1}{9}, \frac{6}{10}, \frac{5}{6}, \frac{4}{25}, \frac{7}{12}, \text{ and } \frac{4}{7}$$

Ask the students to name several fractions that are equivalent to $\frac{1}{2}$. Show

how these can be listed in a series of equivalents. Note the counting patterns in the numerators and in the denominators.

$$\frac{1 \times 2}{2 \times 2} = \frac{2}{4} \quad \frac{1 \times 3}{2 \times 3} = \frac{3}{6} \quad \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$$

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}$$

Have the students make other series of equivalent fractions.

Equivalent Fractions



24 members are in the chorus.

$\frac{1}{8}$ of them wear glasses.

How many wear glasses?

One way to solve this is by finding an **equivalent fraction**

$$\frac{1}{8} = \frac{1 \times 3}{8 \times 3} = \frac{3}{24}$$

Three members of the chorus wear glasses.

To find an equivalent fraction, multiply both the numerator and denominator by the same number.

EXERCISES

Copy and complete.

1. $\frac{1}{4} = \frac{1 \times 2}{4 \times 2} = \frac{2}{8}$
2. $\frac{1}{4} = \frac{1 \times 3}{4 \times 3} = \frac{3}{12}$
3. $\frac{1}{4} = \frac{1 \times 4}{4 \times 4} = \frac{4}{16}$
4. $\frac{1}{5} = \frac{1 \times 2}{5 \times 2} = \frac{2}{10}$
5. $\frac{1}{5} = \frac{1 \times 5}{5 \times 5} = \frac{5}{25}$
6. $\frac{1}{5} = \frac{1 \times 10}{5 \times 10} = \frac{10}{50}$
7. $\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$
8. $\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$
9. $\frac{2}{3} = \frac{2 \times 6}{3 \times 6} = \frac{12}{18}$
10. $\frac{5}{7} = \frac{5 \times 4}{7 \times 4} = \frac{20}{28}$
11. $\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10}$
12. $\frac{3}{8} = \frac{3 \times 3}{8 \times 3} = \frac{9}{24}$
13. $\frac{1}{2} = \frac{5}{10}$
14. $\frac{3}{4} = \frac{6}{8}$
15. $\frac{3}{10} = \frac{9}{30}$
16. $\frac{8}{11} = \frac{16}{22}$

Using the Exercises

- Questions 1 to 12 help the students to get started finding equivalent fractions.
- Questions 13 to 16 require the students to do the multiplying step mentally as they write the missing numerator or denominator of an equivalent fraction.

PRACTICE

Copy and complete.

1. $\frac{2}{5} = \frac{\blacksquare}{20}$ **8**
2. $\frac{5}{9} = \frac{\blacksquare}{36}$ **20**
3. $\frac{6}{7} = \frac{\blacksquare}{35}$ **30**
4. $\frac{3}{8} = \frac{6}{\blacksquare}$ **16**
5. $\frac{3}{5} = \frac{\blacksquare}{15}$ **9**
6. $\frac{3}{4} = \frac{18}{\blacksquare}$ **24**
7. $\frac{7}{8} = \frac{\blacksquare}{16}$ **14**
8. $\frac{1}{7} = \frac{5}{\blacksquare}$ **35**
9. $\frac{5}{6} = \frac{\blacksquare}{24}$ **20**
10. $\frac{5}{9} = \frac{25}{\blacksquare}$ **45**
11. $\frac{7}{12} = \frac{\blacksquare}{36}$ **21**
12. $\frac{3}{10} = \frac{21}{\blacksquare}$ **70**
13. $\frac{1}{3} = \frac{\blacksquare}{6} = \frac{\blacksquare}{9}$ **2, 3**
14. $\frac{1}{6} = \frac{\blacksquare}{12} = \frac{\blacksquare}{18}$ **2, 3**
15. $\frac{1}{9} = \frac{\blacksquare}{18} = \frac{\blacksquare}{27}$ **2, 3**
16. $\frac{3}{5} = \frac{\blacksquare}{10} = \frac{\blacksquare}{15}$ **6, 9**
17. $\frac{7}{8} = \frac{\blacksquare}{16} = \frac{\blacksquare}{24}$ **14, 21**
18. $\frac{11}{12} = \frac{\blacksquare}{24} = \frac{\blacksquare}{36}$ **22, 33**
19. $\frac{3}{4} = \frac{\blacksquare}{8} = \frac{\blacksquare}{12} = \frac{12}{\blacksquare} = \frac{15}{\blacksquare} = \frac{\blacksquare}{24} = \frac{\blacksquare}{28} = \frac{21}{\blacksquare} = \frac{24}{\blacksquare} = \frac{27}{\blacksquare}$ **6, 9, 12, 16, 20, 18, 21, 32, 36**

True or false?

20. $\frac{5}{9} = \frac{25}{54}$ **False**
21. $\frac{3}{8} = \frac{27}{72}$ **True**
22. $\frac{7}{15} = \frac{21}{30}$ **False**
23. $\frac{8}{13} = \frac{24}{39}$ **True**
24. $\frac{6}{11} = \frac{30}{66}$ **False**
25. $\frac{1}{3} = \frac{17}{51}$ **True**

Solve.

26. There are 36 musicians in the orchestra.
 $\frac{1}{3}$ of them play violin. How many play violin? **12**

Patterns

Write the next three fractions in each pattern.

- a. $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{4}{8}, \frac{5}{10}, \frac{6}{12}$**
- b. $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{4}{12}, \frac{5}{15}, \frac{6}{18}$**
- c. $\frac{2}{3}, \frac{4}{6}, \frac{6}{9}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{8}{12}, \frac{10}{15}, \frac{12}{18}$**
- d. $\frac{2}{5}, \frac{4}{10}, \frac{6}{15}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{8}{20}, \frac{10}{25}, \frac{12}{30}$**
- e. $\frac{3}{8}, \frac{6}{16}, \frac{9}{24}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{12}{32}, \frac{15}{40}, \frac{18}{48}$**
- f. $\frac{5}{9}, \frac{10}{18}, \frac{15}{27}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{20}{36}, \frac{25}{45}, \frac{30}{54}$**
- g. $1, \frac{2}{2}, \frac{4}{4}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{6}{6}, \frac{8}{8}, \frac{10}{10}$**
- h. $\frac{1}{2}, \frac{2}{4}, \frac{4}{8}, \blacksquare, \blacksquare, \blacksquare$ **$\frac{8}{16}, \frac{16}{32}, \frac{32}{64}$**

149

Assigning the Practice

Minimum: 1-19, 26

Average: 1-26

Enriched: 1-26

Reinforcement

1. Assign *Patterns* at the bottom of page 149.

2. Draw coloured lines to connect equivalent fractions.

		$\frac{1}{4}$			
		$\frac{3}{12}$	$\frac{2}{8}$		
$\frac{6}{18}$	$\frac{3}{9}$	$\frac{4}{12}$	$\frac{5}{20}$	$\frac{1}{5}$	$\frac{2}{10}$
	$\frac{1}{3}$		$\frac{1}{2}$		
		$\frac{2}{4}$		$\frac{10}{20}$	
			$\frac{3}{6}$		

3. Ask the students to give a reason why the pairs of fractions are or are not equivalent.

- a. $\frac{2}{9}, \frac{14}{54}$
- b. $\frac{6}{25}, \frac{48}{200}$
- c. $\frac{5}{8}, \frac{35}{48}$
- d. $\frac{3}{100}, \frac{300}{10\,000}$
- e. $\frac{7}{50}, \frac{56}{400}$
- f. $\frac{12}{13}, \frac{24}{25}$

Enrichment

Show the students that two fractions are equivalent if their cross-products are equal.

$$\frac{2}{3} \times \frac{6}{9}$$

$$2 \times 9 = 3 \times 6$$

$$18 = 18$$

$$\frac{2}{3} = \frac{6}{9}$$

$$\frac{2}{3} \times \frac{10}{12}$$

$$2 \times 12 \neq 3 \times 10$$

$$24 \neq 30$$

$$\frac{2}{3} \neq \frac{10}{12}$$

Have the students use the cross-products method as they choose = or \neq for the following pairs of fractions.

- a. $\frac{3}{4}, \frac{9}{12}$
- b. $\frac{1}{2}, \frac{6}{10}$
- c. $\frac{5}{6}, \frac{10}{12}$
- d. $\frac{3}{4}, \frac{6}{9}$
- e. $\frac{4}{20}, \frac{12}{60}$
- f. $\frac{27}{30}, \frac{9}{10}$
- g. $\frac{7}{8}, \frac{13}{15}$
- h. $\frac{15}{16}, \frac{45}{48}$

Extra Practice

Complete.

1. $\frac{1}{5} = \frac{3}{15}$
2. $\frac{7}{8} = \frac{49}{56}$
3. $\frac{3}{4} = \frac{12}{16}$
4. $\frac{2}{7} = \frac{4}{14}$
5. $\frac{7}{10} = \frac{49}{70}$
6. $\frac{5}{6} = \frac{35}{42}$
7. $\frac{3}{11} = \frac{15}{55}$
8. $\frac{7}{12} = \frac{35}{60}$
9. $\frac{4}{15} = \frac{12}{45}$
10. $\frac{3}{20} = \frac{15}{100}$
11. $\frac{5}{9} = \frac{40}{72}$
12. $\frac{9}{12} = \frac{72}{96}$
13. $\frac{7}{25} = \frac{21}{75}$
14. $\frac{11}{50} = \frac{44}{200}$
15. $\frac{3}{40} = \frac{12}{160}$
16. $\frac{9}{100} = \frac{36}{400}$
17. $\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15} = \frac{12}{18} = \frac{14}{21} = \frac{16}{24} = \frac{18}{27} = \frac{20}{30} = \frac{22}{33} = \frac{24}{36}$

Solve.

18. Lou bought a dozen oranges but $\frac{1}{6}$ of them were spoiled. How many oranges were spoiled? **2**

Worksheet A34

Pages 148-149

Objective A35

Write the simplest form of a fraction.

Introducing the Lesson

Review writing equivalent fractions in *higher terms* by multiplying. Have the students find the equivalent and name the multiplication for each.

$$\frac{3}{8} = \frac{15}{?} \quad \frac{9}{15} = \frac{45}{?}$$

Teaching the Lesson

Discuss the first part of the lesson example on page 150. Write other fractions which can be written in *simpler terms* on the board. Point out the procedure for finding simpler equivalent fractions.

$$\frac{9 \div 3}{15 \div 3} = \frac{3}{5} \quad \frac{15 \div 5}{20 \div 5} = \frac{3}{4}$$

Do several more examples until the students are sure of the procedure.

Ask the students to make up a rule for the procedure (Divide both the numerator and the denominator by a **common factor**.) Then write the fraction $\frac{12}{36}$ on the chalkboard. Ask for suggestions for writing it in *simpler terms*.

$$\frac{12 \div 6}{36 \div 6} = \frac{2}{6} \quad \frac{12 \div 4}{36 \div 4} = \frac{3}{9}$$

$$\frac{12 \div 2}{36 \div 2} = \frac{6}{18} \quad \frac{12 \div 12}{36 \div 12} = \frac{1}{3}$$

Ask the students which of the answers is the *simplest*. Discuss that, in each case, the numerator and the denominator were divided by a common factor. Ask students to come to the board and circle the common factor used in each example. Compare them. Of the factors 2, 4, 6, and 12, the factor 12 is the *greatest*.

Review the method for finding the Greatest Common Factor as shown on page 150. Demonstrate how dividing by the GCF yields the simplest fraction equivalent by showing several other examples.

Simplifying Fractions

To find a simpler equivalent fraction, **divide** the numerator and denominator by the same number.

$$\frac{8}{12} = \frac{8 \div 2}{12 \div 2} = \frac{4}{6}$$

To find an equivalent fraction in simplest terms, use the GCF (Greatest Common Factor) as the divisor.

The factors of 8 are: 1, 2, 4, 8.

The factors of 12 are: 1, 2, 3, 4, 6, 12.

The GCF of 8 and 12 is 4.

$$\frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

$\frac{8}{12}$ of the instruments are violins.



EXERCISES

Find the GCF of each pair.

1. 6 and 8 **2** 2. 5 and 10 **5** 3. 12 and 18 **6**

Copy and complete.

4. $\frac{6}{8} = \frac{6 \div 2}{8 \div 2} = \frac{3}{4}$ 5. $\frac{4}{8} = \frac{4 \div 4}{8 \div 4} = \frac{1}{2}$ 6. $\frac{10}{15} = \frac{10 \div 5}{15 \div 5} = \frac{2}{3}$
 7. $\frac{12}{18} = \frac{12 \div 6}{18 \div 6} = \frac{2}{3}$ 8. $\frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$ 9. $\frac{18}{24} = \frac{18 \div 6}{24 \div 6} = \frac{3}{4}$
 10. $\frac{16}{24} = \frac{16 \div 8}{24 \div 8} = \frac{2}{3}$ 11. $\frac{14}{21} = \frac{14 \div 7}{21 \div 7} = \frac{2}{3}$ 12. $\frac{18}{27} = \frac{18 \div 9}{27 \div 9} = \frac{2}{3}$

Write in simplest terms.

13. $\frac{2}{4}$ **$\frac{1}{2}$** 14. $\frac{24}{36}$ **$\frac{2}{3}$** 15. $\frac{8}{16}$ **$\frac{1}{2}$** 16. $\frac{9}{12}$ **$\frac{3}{4}$** 17. $\frac{30}{50}$ **$\frac{3}{5}$**

150

Using the Exercises

- Questions 1 to 3 review finding the GCF.
- Questions 4 and 5 help the student to get started simplifying fractions by giving the GCF.
- Questions 6 to 12 require students to provide the GCF and then divide to obtain the simplest fraction.
- For questions 13 to 17, the students must do all steps on their own. See that they use the GCF to find the simplest fraction.

PRACTICE

Find the GCF of each pair.

1. 20 and 24 4 2. 28 and 42 14 3. 18 and 36 18

Write in simplest terms.

4. $\frac{15}{25} = \frac{3}{5}$ 5. $\frac{22}{33} = \frac{2}{3}$ 6. $\frac{4}{12} = \frac{1}{3}$ 7. $\frac{3}{15} = \frac{1}{5}$ 8. $\frac{13}{39} = \frac{1}{3}$
 9. $\frac{5}{15} = \frac{1}{3}$ 10. $\frac{6}{18} = \frac{1}{3}$ 11. $\frac{10}{18} = \frac{5}{9}$ 12. $\frac{10}{25} = \frac{2}{5}$ 13. $\frac{7}{28} = \frac{1}{4}$
 14. $\frac{15}{24} = \frac{5}{8}$ 15. $\frac{9}{36} = \frac{1}{4}$ 16. $\frac{17}{34} = \frac{1}{2}$ 17. $\frac{14}{42} = \frac{1}{3}$ 18. $\frac{24}{36} = \frac{2}{3}$
 19. $\frac{8}{14} = \frac{4}{7}$ 20. $\frac{30}{36} = \frac{5}{6}$ 21. $\frac{9}{21} = \frac{3}{7}$ 22. $\frac{24}{32} = \frac{3}{4}$ 23. $\frac{35}{56} = \frac{5}{8}$

Which fractions **cannot** be simplified?

24. $\frac{2}{6}, \frac{4}{12}, \frac{3}{5}$ 25. $\frac{5}{7}, \frac{3}{4}, \frac{20}{25}$ 26. $\frac{9}{16}, \frac{4}{9}, \frac{21}{24}$
 27. $\frac{8}{21}, \frac{11}{28}, \frac{1}{4}$ 28. $\frac{5}{30}, \frac{7}{25}, \frac{20}{21}$ 29. $\frac{23}{30}, \frac{6}{41}, \frac{8}{29}$

Answer using a fraction in simplest terms.

30. There were 23 players at band practice.
 Four players were absent.
 There are 9 trumpets in the band.
 What fraction of the band play trumpet? $\frac{1}{3}$

Odd Fractions

Ellen discovered an easy way to simplify fractions.
 Study these:

$$\frac{24}{85} = \frac{2}{5} \quad \frac{19}{85} = \frac{1}{5}$$

Does Ellen's method always work?

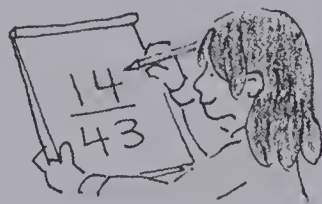
$$\frac{14}{43} \text{ does not equal } \frac{1}{3}$$



Does the shortcut work for these?

$$\frac{16}{64}, \frac{17}{75}, \frac{17}{72}, \frac{13}{35}, \frac{13}{39}, \frac{49}{98}, \frac{12}{21}, \frac{12}{24}$$

✓ × × × × ✓ × ×



151

Assigning the Practice

Minimum: 1-23

Average: 1-30

Enriched: 1-30

Reinforcement

1. Ask the students to solve the following problem.

Mr. Burbank, the band leader, kept an attendance record for band practice for a week. Write a fraction to show the attendance for each day, then write the fraction in simplest form.

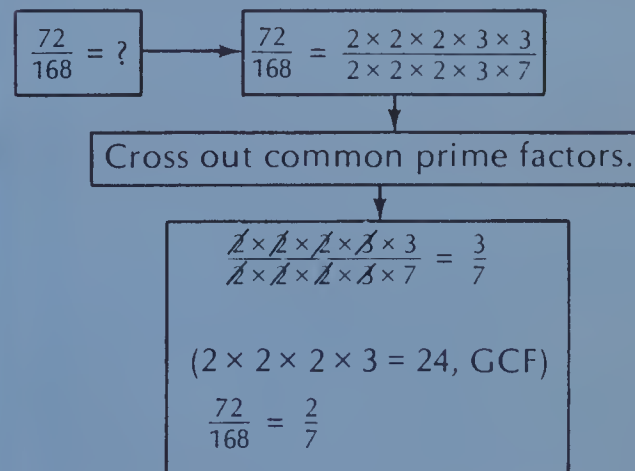
	M	T	W	T	F	S
Number in Attendance	42	36	30	45	43	44
Number of Band Members	48	48	48	48	48	48
Fraction						
Simplest Form						

2. Prepare a set of flash cards of fractions which are not in simplest terms. Use these for individual help, a team game, or a classroom drill in simplifying fractions.

Enrichment

1. Assign *Odd Fractions* at the bottom of page 151.

2. Show the students how expressing numbers as products of prime factors is another good method for simplifying fractions. Point out that it is especially useful for larger numbers.



Simplify these fractions by the product of prime factors method.

- a. $\frac{48}{80}$ b. $\frac{72}{90}$ c. $\frac{120}{144}$

Extra Practice

Worksheet A35

Pages 150-151

Find the GCF of each pair of numbers

1. 24 and 30 6 2. 36 and 48 12 3. 50 and 75 25

Write in simplest terms.

4. $\frac{10}{12} = \frac{5}{6}$ 5. $\frac{10}{15} = \frac{2}{3}$ 6. $\frac{40}{60} = \frac{2}{3}$ 7. $\frac{15}{45} = \frac{1}{3}$
 8. $\frac{18}{24} = \frac{3}{4}$ 9. $\frac{30}{36} = \frac{5}{6}$ 10. $\frac{27}{45} = \frac{3}{5}$ 11. $\frac{48}{60} = \frac{4}{5}$
 12. $\frac{90}{120} = \frac{3}{4}$ 13. $\frac{40}{100} = \frac{2}{5}$ 14. $\frac{66}{99} = \frac{2}{3}$ 15. $\frac{40}{80} = \frac{1}{2}$

Which fraction cannot be written in simpler terms?

6. $\frac{6}{18}, \frac{15}{18}, \frac{17}{18}$ 17. $\frac{14}{24}, \frac{13}{24}, \frac{21}{24}$

UNIT 7 LESSON 4

Objective N12

Compare fractions.

Introducing the Lesson

Show the students a chocolate bar which has been broken into 24 sections. Place 12 sections in a group and ask what fraction of the chocolate bar these are. Do the same for other subsets of the 24 pieces. Ask the students to devise comparison statements using these fractional parts of the chocolate bar.

$$\frac{12}{24} > \frac{9}{24}$$

$$\frac{3}{24} < \frac{4}{24}$$

Point out how easy it is to compare the fractions when the denominators are the same. One only needs to compare the numerators.

$$6 < 7 \text{ so } \frac{6}{24} < \frac{7}{24}$$

Teaching the Lesson

Examine with the students the lesson example at the top of page 152. Model the problem with two rolls of hard candies (10 pieces to a roll) on the overhead projector. Separate the 10 candies in one roll into fifths and separate the other roll into tenths.

Show how $\frac{2}{5}$ is equal to $\frac{4}{10}$. Then point out that since $\frac{4}{10} > \frac{3}{10}$, then $\frac{2}{5} > \frac{3}{10}$.

Emphasize the rule that to compare fractions, the fractions must have the same denominator. If the denominators are not the same, an equivalent fraction must be written.

Ask the students to compare several other pairs of fractions with unlike denominators. Show the three steps involved.

Change: $\frac{9 \times 2}{13 \times 2} = \frac{18}{26}$	→	Compare: $\frac{18}{26} < \frac{19}{26}$	→	Conclude: $\frac{9}{13} < \frac{19}{26}$
---	---	---	---	---

Students should write equivalent fractions in twenty-fourths for each of the following in order to write these fractions in order, starting from the least.

$$\frac{5}{6}, \frac{5}{8}, \frac{11}{12}, \frac{3}{4}, \frac{3}{3}, \frac{7}{8}, \frac{1}{6}, \frac{3}{3}, \frac{1}{2}$$

Comparing Fractions

Which is greater, $\frac{2}{5}$ or $\frac{3}{10}$?

$$\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10}$$

$$\frac{4}{10} > \frac{3}{10} \text{ so, } \frac{2}{5} > \frac{3}{10}$$

Compare fractions with the same denominator.



$$\frac{2}{5} = \frac{4}{10} > \frac{3}{10}$$

So $\frac{2}{5} > \frac{3}{10}$

EXERCISES

Copy and complete. Write < or >.

1. $\frac{6}{7} > \frac{3}{7}$

2. $\frac{3}{5} < \frac{5}{5}$

3. $\frac{9}{12} < \frac{11}{12}$

4. $\frac{7}{8} > \frac{5}{8}$

5. $\frac{1}{3} = \frac{2}{6}$

6. $\frac{1}{4} = \frac{2}{8}$

7. $\frac{1}{2} = \frac{4}{8}$

8. $\frac{2}{3} = \frac{6}{9}$

9. $\frac{1}{2} = \frac{5}{10}$

10. $\frac{3}{4} = \frac{6}{8}$

11. $\frac{2}{3} < \frac{5}{6}$

12. $\frac{5}{9} > \frac{9}{18}$

13. $\frac{3}{5} < \frac{11}{15}$

14. $\frac{6}{7} > \frac{17}{21}$

Write an equivalent fraction in twelfths for each one. Then write the original fractions in order, starting with the least.

15. $\frac{1}{2}, \frac{1}{6}, \frac{3}{4}, \frac{2}{3}, \frac{1}{4}, \frac{1}{3}, \frac{5}{6}$ $\frac{6}{12}, \frac{2}{12}, \frac{9}{12}, \frac{8}{12}, \frac{3}{12}, \frac{4}{12}, \frac{10}{12}$

152

Using the Exercises

- Questions 1 to 4 require the students to compare fractions with like denominators.
- Questions 5 to 10 give the students help with the three steps (change, compare, conclude) involved in the comparison of fractions with unlike denominators.
- Questions 11 to 14 require the students to do all of the comparison steps on their own.
- Question 15 helps the students order the set of seven fractions by suggesting the common denominator.

PRACTICE

Copy and complete. Write $>$ or $<$.

1. $\frac{4}{7} \bullet \frac{5}{21}$ $>$
2. $\frac{2}{3} \bullet \frac{8}{9}$ $<$
3. $\frac{3}{5} \bullet \frac{17}{35}$ $>$
4. $\frac{4}{9} \bullet \frac{7}{18}$ $>$
5. $\frac{5}{12} \bullet \frac{11}{24}$ $<$
6. $\frac{1}{4} \bullet \frac{5}{16}$ $<$
7. $\frac{9}{10} \bullet \frac{91}{100}$ $<$
8. $\frac{4}{5} \bullet \frac{7}{10}$ $>$
9. $\frac{3}{8} \bullet \frac{7}{72}$ $>$
10. $\frac{7}{10} \bullet \frac{69}{100}$ $>$
11. $\frac{9}{100} \bullet \frac{1}{10}$ $<$
12. $\frac{3}{5} \bullet \frac{5}{10}$ $>$

Write equivalent fractions with the given denominator.

13. denominator 24 $\frac{1}{6}, \frac{3}{8}, \frac{1}{4}$ $\frac{4}{24}, \frac{9}{24}, \frac{6}{24}$
14. denominator 32 $\frac{3}{4}, \frac{5}{8}, \frac{9}{16}$ $\frac{24}{32}, \frac{20}{32}, \frac{18}{32}$
15. denominator 48 $\frac{5}{12}, \frac{1}{6}, \frac{1}{16}$ $\frac{20}{48}, \frac{8}{48}, \frac{3}{48}$

Write the fractions in order, from least to greatest.

16. $\frac{9}{12}, \frac{3}{4}, \frac{2}{3}, \frac{5}{6}, \frac{1}{2}$ $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}, \frac{9}{12}$
17. $\frac{17}{28}, \frac{6}{7}, \frac{3}{4}, \frac{1}{2}, \frac{11}{14}$ $\frac{1}{2}, \frac{17}{28}, \frac{3}{4}, \frac{11}{14}, \frac{6}{7}$

REVIEW

Draw a rectangle and shade it to show the fraction

1. $\frac{3}{5}$ 
2. $\frac{5}{8}$ 
3. $\frac{9}{10}$ 
4. $\frac{11}{11}$ 

Copy and complete.

5. $\frac{3}{7} = \frac{\blacksquare}{28}$ 12
6. $\frac{5}{9} = \frac{\blacksquare}{18}$ 10
7. $\frac{2}{3} = \frac{8}{\blacksquare}$ 12

Write in simplest terms.

8. $\frac{15}{24}$ $\frac{5}{8}$
9. $\frac{20}{35}$ $\frac{4}{7}$
10. $\frac{12}{36}$ $\frac{1}{3}$
11. $\frac{18}{24}$ $\frac{3}{4}$

Copy and complete. Write $<$ or $>$.

12. $\frac{3}{4} \bullet \frac{5}{8}$ $>$
13. $\frac{7}{10} \bullet \frac{29}{40}$ $<$
14. $\frac{2}{11} \bullet \frac{5}{33}$ $>$

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Assigning the Practice

Minimum: 1-16

Average: 1-17

Enriched: 1-17

Review Exercises

Questions	Objective	Pages
1-4	N11	146-147
5-7	A34	148-149
8-11	A35	150-151
12-14	N12	152-153

Reinforcement

1. Give the students graph paper. Ask them to trace equal-sized rectangles, divide them into equal-sized parts, and shade to show the following comparisons.

- a. $\frac{1}{6} < \frac{1}{3}$
- b. $\frac{3}{4} > \frac{5}{8}$
- c. $\frac{1}{4} > \frac{1}{8}$
- d. $\frac{3}{5} < \frac{7}{10}$
- e. $\frac{5}{7} < \frac{16}{21}$
- f. $\frac{3}{9} = \frac{6}{18}$

2. Write equivalent fractions in hundredths and then put all fractions in order from least to greatest.

$$\frac{1}{4}, \frac{1}{2}, \frac{3}{5}, \frac{19}{20}, \frac{7}{10}, \frac{16}{25}, \frac{21}{50}, \frac{3}{4}, \frac{1}{5}, \frac{4}{25}$$

Enrichment

1. Write these pairs of fractions with a common denominator and then name a fraction in simplest terms that comes between the two in value.

- a. $\frac{1}{3}, \frac{4}{6}$
- b. $\frac{3}{10}, \frac{1}{2}$
- c. $\frac{3}{4}, \frac{8}{8}$
- d. $\frac{7}{12}, \frac{3}{4}$

2. Ask the students to order the following fractions in simplest terms.

$$\frac{30}{60}, \frac{15}{60}, \frac{50}{60}, \frac{40}{60}, \frac{48}{60}, \frac{55}{60}, \frac{5}{60}, \frac{10}{60}$$

Extra Practice

Worksheet N12

Pages 152-153

Compare the fractions. Write $<$, $>$, or $=$

1. $\frac{1}{5} \bigcirc \frac{1}{10}$ $>$
2. $\frac{3}{7} \bigcirc \frac{11}{28}$ $>$
3. $\frac{2}{5} \bigcirc \frac{6}{15}$ $=$
4. $\frac{2}{14} \bigcirc \frac{3}{7}$ $<$
5. $\frac{3}{10} \bigcirc \frac{31}{100}$ $<$
6. $\frac{5}{8} \bigcirc \frac{29}{48}$ $>$
7. $\frac{25}{36} \bigcirc \frac{8}{12}$ $>$
8. $\frac{63}{81} \bigcirc \frac{7}{9}$ $=$
9. $\frac{5}{24} \bigcirc \frac{1}{6}$ $>$
10. $\frac{20}{32} \bigcirc \frac{3}{4}$ $<$
11. $\frac{7}{10} \bigcirc \frac{42}{60}$ $=$
12. $\frac{9}{8} \bigcirc \frac{27}{24}$ $=$

Write equivalent fractions with the given denominator

13. denominator 36 $\frac{1}{4}, \frac{2}{9}, \frac{1}{6}$ $\frac{9}{36}, \frac{8}{36}, \frac{6}{36}$
14. denominator 50 $\frac{4}{5}, \frac{3}{10}, \frac{1}{2}$ $\frac{40}{50}, \frac{15}{50}, \frac{25}{50}$

Write the fractions in order, from least to greatest

15. $\frac{1}{5}, \frac{3}{20}, \frac{3}{4}, \frac{7}{10}, \frac{1}{2}$ $\frac{3}{20}, \frac{1}{5}, \frac{1}{2}, \frac{7}{10}, \frac{3}{4}$
16. $\frac{5}{24}, \frac{1}{6}, \frac{1}{2}, \frac{5}{12}, \frac{3}{4}, \frac{5}{8}$ $\frac{1}{6}, \frac{5}{24}, \frac{5}{12}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}$

UNIT 7 LESSON 5

Objective N13

Write mixed numerals as fractions.

Introducing the Lesson

Show the students $3\frac{1}{2}$ apples. Ask, "How many apples?" Ask, "How many halves are there?" Seven. "How do you know?" Let a student cut the three apples into halves. Use the apples to show that $3\frac{1}{2}$ and $\frac{7}{2}$ are two names for the same amount.



$$3\frac{1}{2} = \frac{2}{2} + \frac{2}{2} + \frac{2}{2} + \frac{1}{2} = \frac{7}{2}$$

Explain that $\frac{7}{2}$ is a fraction and that $3\frac{1}{2}$ is called a **mixed numeral** because it is made up of a whole number and a fraction.

Teaching the Lesson

Read and discuss the top of page 154. Point out the two illustrations of how $1\frac{1}{4}$ can also be written as $\frac{5}{4}$ and of how $2\frac{2}{3}$ can also be written as $\frac{8}{3}$.

Have the students change several mixed numerals to fractions with the aid of pictures.

$$1\frac{2}{5} = ? \rightarrow \text{[Diagram: 1 whole bar divided into 5 parts, 2 parts shaded]} \rightarrow 1\frac{2}{5} = \frac{7}{5}$$

$$2\frac{3}{4} = ? \rightarrow \text{[Diagram: 2 whole circles divided into 4 parts each, 3 parts shaded]} \rightarrow 2\frac{3}{4} = \frac{11}{4}$$

See if the students can suggest a way of changing a mixed numeral to a fraction without the aid of pictures. Explain the short-cut method, for example:

$$2\frac{1}{8} = \text{[Cloud: } 8 \times 2 + 1 \text{ eighths]} = \frac{17}{8}$$

$$5\frac{3}{7} = \text{[Cloud: } 7 \times 5 + 3 \text{ sevenths]} = \frac{38}{7}$$

Point out that the denominator of the mixed numeral and of the fraction is always the same.

Mixed Numerals



$$1 + \frac{1}{4} = 1\frac{1}{4}$$



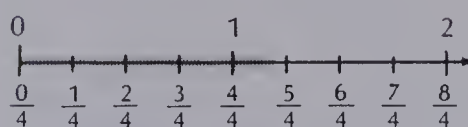
$$1 + 1 + \frac{2}{3} = 2\frac{2}{3}$$



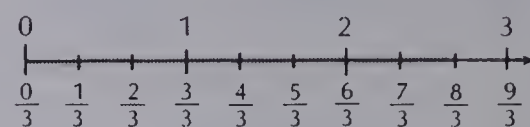
$$\frac{4}{4} + \frac{1}{4} = \frac{5}{4}$$



$$\frac{3}{3} + \frac{3}{3} + \frac{2}{3} = \frac{8}{3}$$



$$\frac{5}{4} = 1\frac{1}{4}$$



$$\frac{8}{3} = 2\frac{2}{3}$$

fraction

mixed numeral

fraction

mixed numeral

EXERCISES

Change the mixed numeral to a fraction.

- $1\frac{2}{5} = \frac{7}{5}$
- $1\frac{1}{6} = \frac{7}{6}$
- $2\frac{2}{3} = \frac{8}{3}$
- $1\frac{3}{4} = \frac{7}{4}$
- $2\frac{5}{6} = \frac{17}{6}$
- $2\frac{3}{7} = \frac{17}{7}$
- $3\frac{1}{2} = \frac{7}{2}$
- $9\frac{3}{4} = \frac{39}{4}$
- $5\frac{6}{7} = \frac{41}{7}$
- $2\frac{3}{5} = \frac{13}{5}$
- $7\frac{1}{3} = \frac{22}{3}$
- $4\frac{5}{8} = \frac{37}{8}$
- $2\frac{1}{3} = \frac{7}{3}$
- $5\frac{1}{2} = \frac{11}{2}$
- $3\frac{7}{10} = \frac{37}{10}$
- $4\frac{2}{5} = \frac{22}{5}$
- $6\frac{5}{8} = \frac{53}{8}$
- $3\frac{4}{7} = \frac{25}{7}$
- $5\frac{1}{9} = \frac{46}{9}$
- $4\frac{4}{6} = \frac{28}{6}$
- $7\frac{2}{8} = \frac{58}{8}$
- $9\frac{5}{7} = \frac{68}{7}$

Using the Exercises

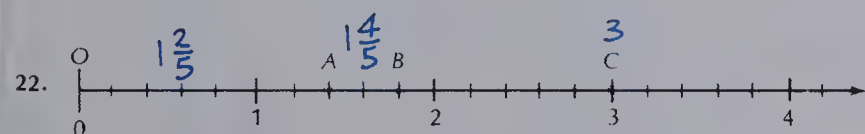
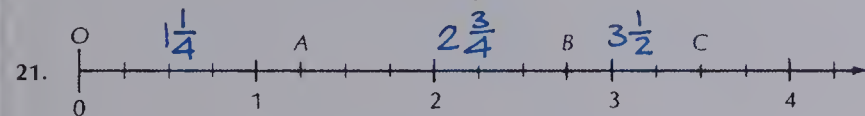
- Questions 1 to 6 help the students change the mixed numerals to fractions with illustrations.
- Questions 7 to 22 give the students developmentally structured practice in changing mixed numerals to fractions on their own.

PRACTICE

Change the mixed numeral to a fraction.

1. $2\frac{1}{2} = \frac{5}{2}$
2. $3\frac{2}{3} = \frac{11}{3}$
3. $5\frac{3}{4} = \frac{23}{4}$
4. $4\frac{1}{4} = \frac{17}{4}$
5. $1\frac{2}{3} = \frac{5}{3}$
6. $7\frac{1}{5} = \frac{36}{5}$
7. $1\frac{4}{7} = \frac{11}{7}$
8. $8\frac{1}{2} = \frac{17}{2}$
9. $2\frac{5}{7} = \frac{19}{7}$
10. $3\frac{4}{5} = \frac{19}{5}$
11. $4\frac{2}{3} = \frac{14}{3}$
12. $6\frac{1}{9} = \frac{55}{9}$
13. $7\frac{2}{9} = \frac{65}{9}$
14. $10\frac{3}{5} = \frac{53}{5}$
15. $1\frac{3}{4} = \frac{7}{4}$
16. $5\frac{3}{8} = \frac{43}{8}$
17. $5\frac{3}{100} = \frac{503}{100}$
18. $3\frac{2}{25} = \frac{77}{25}$
19. $2\frac{7}{40} = \frac{87}{40}$
20. $6\frac{5}{11} = \frac{71}{11}$

Write a mixed numeral for the length of OA, OB, and OC.



23. A long-playing record spins $33\frac{1}{3}$ times every minute.
Write this as a fraction. $\frac{100}{3}$

It's about time...

Four students recorded the length of their band concert.
Are the lengths the same?

Katia	$1\frac{3}{4}$ h
Ravinder	105 min
Nina	1 h 45 min
Ted	7 quarter-hours

Write each in 3 different ways.

- a. $2\frac{1}{4}$ h b. 90 min c. 3 h 15 min
- 135 min, 2 h 15 min $1\frac{1}{2}$ h, 1 h 30 min $3\frac{1}{4}$ h, 195 min ¹⁵⁵
 9 quarter hours 6 quarter hours 13 quarter hours

Assigning the Practice

Minimum: 1-21

Average: 3-23

Enriched: 3-23

Reinforcement

1. Give the students a sheet of number lines (similar to those on page 155) and a ruler. Ask them to measure and mark equal intervals between the whole numbers so that they can illustrate the fraction the following mixed numerals represent.

a. $4\frac{1}{5}$ b. $2\frac{3}{8}$ c. $1\frac{1}{6}$

d. $3\frac{3}{10}$ e. $4\frac{2}{3}$ f. $2\frac{3}{4}$

2. Prepare a set of 16 mixed numeral cards and a set of equivalent fraction cards. Let the students use them for a game of "Concentration".

3. Use the above mentioned mixed numeral cards as flash cards in a quick oral drill.

Enrichment

1. Assign *It's about time ...* at the bottom of page 155.

2. Write the following mixed numerals as a fraction and as a decimal. For

example, $1\frac{3}{10} = \frac{13}{10} = 1.3$

a. $3\frac{2}{10}$ b. $5\frac{7}{10}$ c. $4\frac{9}{10}$

d. $1\frac{1}{100}$ e. $3\frac{21}{100}$ f. $6\frac{85}{100}$

Extra Practice

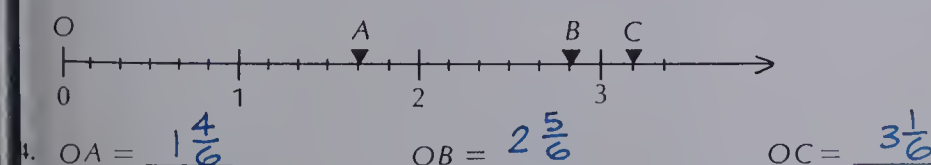
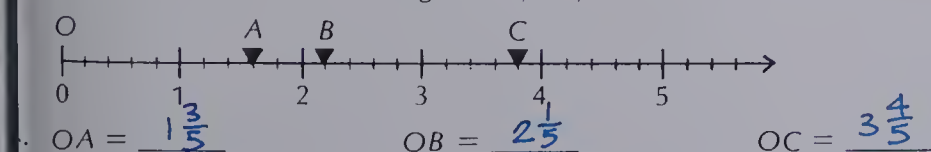
Worksheet N13

Pages 154-155

Change the mixed numeral to a fraction.

1. $3\frac{1}{5} = \frac{16}{5}$
2. $4\frac{1}{4} = \frac{17}{4}$
3. $2\frac{2}{7} = \frac{16}{7}$
4. $6\frac{1}{8} = \frac{49}{8}$
5. $7\frac{1}{2} = \frac{15}{2}$
6. $3\frac{5}{8} = \frac{29}{8}$
7. $6\frac{9}{10} = \frac{69}{10}$
8. $4\frac{2}{5} = \frac{22}{5}$
9. $5\frac{3}{7} = \frac{38}{7}$
10. $1\frac{1}{3} = \frac{4}{3}$
11. $9\frac{5}{9} = \frac{86}{9}$
12. $4\frac{3}{10} = \frac{43}{10}$

Write mixed numerals for the lengths OA, OB, and OC.



UNIT 7 LESSON 6

Objective N14

Write fractions as mixed numerals.

Introducing the Lesson

Write the following on the chalkboard and have the students complete it. Ask them to explain how they got their answers.

$$7 \text{ days} = 1 \text{ week} \quad 9 \text{ days} = 1\frac{2}{7} \text{ weeks}$$

$$10 \text{ days} = \blacksquare \text{ weeks} \quad 11 \text{ days} = \blacksquare \text{ weeks}$$

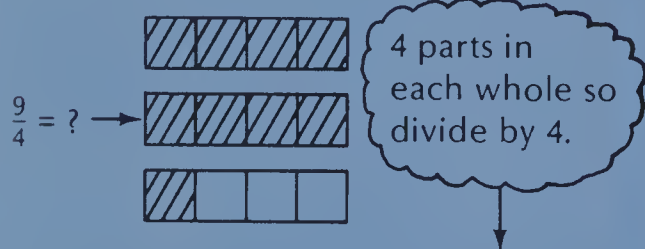
$$14 \text{ days} = \blacksquare \text{ weeks} \quad 16 \text{ days} = \blacksquare \text{ weeks}$$

Point out that in each case the number of days was divided by seven since there are seven days in one whole week.

Teaching the Lesson

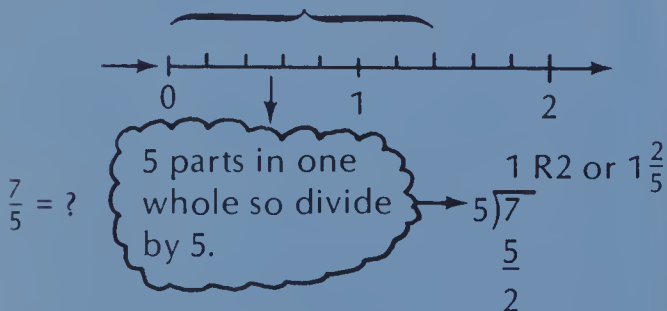
Discuss the lesson example given at the top of page 156. Note the illustration for $\frac{13}{5}$. Point out that since there are 5 parts in each whole rectangle, 13 is divided by 5 to get the mixed numeral for $\frac{13}{5}$.

Show these examples at the chalkboard.



$$2 \text{ R}1 \text{ or } 2\frac{1}{4}$$

$$\begin{array}{r} 4 \overline{)9} \\ 8 \\ \hline 1 \end{array}$$



Soon the students should realize that to change a fraction to a mixed numeral, one divides by the denominator of the fraction.

Have the students practice the division method with several other examples.

Mixed Numerals



Can you write $\frac{13}{5}$ as a mixed numeral?



Draw a figure.



$$\frac{13}{5} = 1 + 1 + \frac{3}{5} = 2\frac{3}{5}$$

Divide.

$$\frac{13}{5} \rightarrow 5 \overline{)13} \rightarrow 2\frac{3}{5}$$

$$\begin{array}{r} 2 \\ 5 \overline{)13} \\ 10 \\ \hline 3 \end{array}$$

Write the remainder as a fraction.

EXERCISES

Write the fraction as a mixed numeral.

1. $\frac{9}{4} = \blacksquare 2\frac{1}{4}$ 2. $\frac{5}{3} = \blacksquare 1\frac{2}{3}$ 3. $\frac{11}{8} = \blacksquare 1\frac{3}{8}$

4. $\frac{13}{5} = \blacksquare 2\frac{3}{5}$ 5. $\frac{11}{6} = \blacksquare 1\frac{5}{6}$ 6. $\frac{16}{9} = \blacksquare 1\frac{7}{9}$

Use division to change the fraction to a mixed numeral.

7. $\frac{5}{3} 1\frac{2}{3}$ 8. $\frac{9}{4} 2\frac{1}{4}$ 9. $\frac{16}{7} 2\frac{2}{7}$ 10. $\frac{18}{5} 3\frac{3}{5}$ 11. $\frac{25}{8} 3\frac{1}{8}$
 12. $\frac{11}{4} 2\frac{3}{4}$ 13. $\frac{9}{2} 4\frac{1}{2}$ 14. $\frac{29}{10} 2\frac{9}{10}$ 15. $\frac{12}{5} 2\frac{2}{5}$ 16. $\frac{45}{7} 6\frac{3}{7}$
 17. $\frac{61}{9} 6\frac{7}{9}$ 18. $\frac{42}{8} 5\frac{2}{8}$ 19. $\frac{16}{8} 2$ 20. $\frac{29}{5} 5\frac{4}{5}$ 21. $\frac{65}{6} 10\frac{5}{6}$
 22. $\frac{42}{9} 4\frac{6}{9}$ 23. $\frac{72}{9} 8$ 24. $\frac{45}{4} 11\frac{1}{4}$ 25. $\frac{53}{10} 5\frac{3}{10}$ 26. $\frac{34}{5} 6\frac{4}{5}$

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Using the Exercises

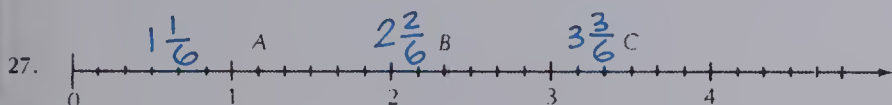
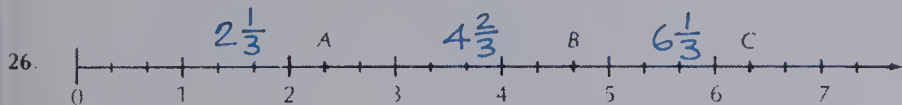
- Questions 1 to 6 require the students to write the fractions as mixed numerals with the help of an illustration.
- Questions 7 to 26 require that mixed numerals be written without the aid of illustrations.

PRACTICE

Use division to change the fraction to a mixed numeral.

1. $\frac{15}{6} = 2\frac{3}{6}$
2. $\frac{8}{3} = 2\frac{2}{3}$
3. $\frac{32}{4} = 8$
4. $\frac{27}{5} = 5\frac{2}{5}$
5. $\frac{35}{5} = 7$
6. $\frac{25}{8} = 3\frac{1}{8}$
7. $\frac{17}{12} = 1\frac{5}{12}$
8. $\frac{22}{7} = 3\frac{1}{7}$
9. $\frac{42}{6} = 7$
10. $\frac{52}{8} = 6\frac{4}{8}$
11. $\frac{41}{6} = 6\frac{5}{6}$
12. $\frac{38}{3} = 12\frac{2}{3}$
13. $\frac{15}{7} = 2\frac{1}{7}$
14. $\frac{28}{4} = 7$
15. $\frac{26}{3} = 8\frac{2}{3}$
16. $\frac{48}{5} = 9\frac{3}{5}$
17. $\frac{21}{2} = 10\frac{1}{2}$
18. $\frac{49}{6} = 8\frac{1}{6}$
19. $\frac{33}{10} = 3\frac{3}{10}$
20. $\frac{35}{6} = 5\frac{5}{6}$
21. $\frac{80}{9} = 8\frac{8}{9}$
22. $\frac{74}{6} = 12\frac{2}{6}$
23. $\frac{88}{7} = 12\frac{4}{7}$
24. $\frac{101}{10} = 10\frac{1}{10}$
25. $\frac{100}{11} = 9\frac{1}{11}$

What mixed numeral corresponds to A? to B? to C?



28. Pi is a special number used to calculate the circumference and area of a circle.

Pi is about $\frac{22}{7}$. Write $\frac{22}{7}$ as a mixed numeral. $3\frac{1}{7}$

Division — 3 Ways

Division can be written three ways.

Using \div
 $29 \div 8$

As a fraction
 $\frac{29}{8}$

Write each expression two other ways.

- a. $26 \div 9$ b. $7 \overline{)48}$ c. $\frac{56}{5}$ d. $100 \div 71$ e. $\frac{638}{51}$
- $9 \overline{)26}$ $\frac{26}{9}$ $48 \div 7$ $56 \div 5$ $638 \div 51$ $100 \div 71$ $51 \overline{)638}$
- $\frac{48}{7}$ $5 \overline{)56}$ $71 \overline{)100}$ $51 \overline{)638}$

Assigning the Practice

Minimum: 1-25

Average: 4-28

Enriched: 4-28

Reinforcement

1. Assign *Division—3 Ways* at the bottom of page 157.

2. Ask the students to complete the following charts.

4 quarters = 1 dollar

5 quarters = $1\frac{1}{4}$ dollars

7 quarters = _____ dollars

9 quarters = _____ dollars

10 quarters = _____ dollars

13 quarters = _____ dollars

60 minutes = 1 hour

69 minutes = $1\frac{9}{60}$ hours

73 minutes = _____ hours

99 minutes = _____ hours

120 minutes = _____ hours

132 minutes = _____ hours

3. Have the students show on a number line the mixed numerals that each of the following fractions represent.

a. $\frac{9}{4}$ b. $\frac{5}{2}$ c. $\frac{6}{3}$

d. $\frac{11}{12}$ e. $\frac{10}{5}$ f. $\frac{7}{6}$

Enrichment

1. Write each mixed numeral in simplest terms and then draw an illustration to demonstrate it.

a. $4\frac{4}{8}$

b. $6\frac{4}{6}$

c. $7\frac{10}{12}$

d. $3\frac{16}{20}$

e. $1\frac{10}{18}$

f. $5\frac{18}{24}$

2. Use a calculator to solve these division problems which are written in each of the three different ways.

a. $\frac{780}{12} = \blacksquare$

b. $1794 \div 23 = \blacksquare$

c. $82 \overline{)3854}$

d. $\frac{1568}{98} = \blacksquare$

Extra Practice

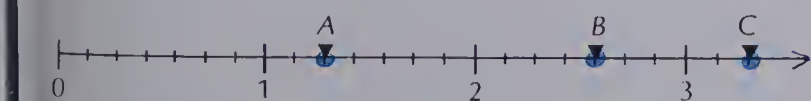
Worksheet N14

Pages 156-157

Use division to change the fraction to a mixed numeral.

1. $\frac{17}{5} = 3\frac{2}{5}$
2. $\frac{10}{7} = 1\frac{3}{7}$
3. $\frac{12}{8} = 1\frac{4}{8}$
4. $\frac{21}{5} = 4\frac{1}{5}$
5. $\frac{19}{3} = 6\frac{1}{3}$
6. $\frac{55}{6} = 9\frac{1}{6}$
7. $\frac{90}{45} = 2$
8. $\frac{10}{3} = 3\frac{1}{3}$
9. $\frac{33}{5} = 6\frac{3}{5}$
10. $\frac{20}{6} = 3\frac{2}{6}$
11. $\frac{17}{8} = 2\frac{1}{8}$
12. $\frac{110}{11} = 10$

What mixed numeral corresponds to A? B? C?



3. A = $1\frac{2}{7}$ B = $2\frac{4}{7}$ C = $3\frac{2}{7}$

UNIT 7 LESSON 7

Objective A36

Write fractions as decimals.

Introducing the Lesson

Review expressing fractions in tenths, hundredths, and thousandths as

decimals. Write $\frac{1}{10}$, $\frac{3}{10}$, $\frac{5}{10}$, $\frac{9}{10}$, and $\frac{10}{10}$ on the chalkboard. Ask the students to say the fraction aloud and then record the decimal. Recall that tenths have one decimal place. Discuss $\frac{10}{10}$ as one whole or 1.0.

Write $\frac{1}{100}$, $\frac{7}{100}$, $\frac{45}{100}$, and $\frac{100}{100}$ on the chalkboard and have the students read them aloud and record them as decimals. Recall that hundredths have two decimal places and that $\frac{100}{100} =$ one whole or 1.0. Follow the same procedure for $\frac{1}{1000}$, $\frac{9}{1000}$, $\frac{67}{1000}$, $\frac{822}{1000}$, and $\frac{1000}{1000}$.

Teaching the Lesson

Read and discuss the two methods for changing fractions to decimals given at the top of page 158. Talk about **Method 1** first. Explain that sometimes it is convenient to write an equivalent fraction in tenths, and other times it is more convenient to write an equivalent fraction in hundredths.

Have the students change $\frac{7}{20}$, $\frac{4}{5}$, $\frac{3}{25}$, $\frac{1}{4}$, and $\frac{27}{50}$ to decimals using Method 1.

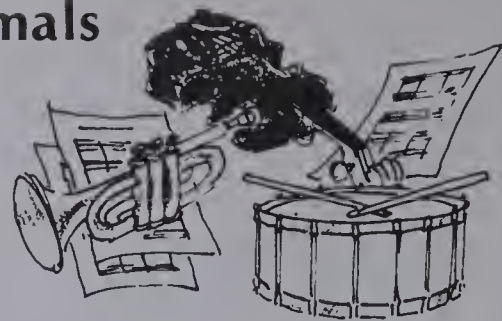
Encourage them to think first whether an equivalent fraction in tenths or hundredths would be more convenient.

Discuss **Method 2** shown at the top of page 158. Explain that **all fractions indicate a division**. For example, $\frac{2}{5}$ means 2 divided by 5. Point out that as many zeros as are needed can be annexed in the dividend.

$$\begin{array}{r} 0.4 \\ 5 \overline{)2.0} \\ \underline{20} \\ 0 \end{array} \quad \frac{2}{5} = 0.4$$

Fractions and Decimals

A survey of the Grade 6 class showed that $\frac{2}{5}$ of the students play an instrument and $\frac{5}{8}$ of the students would like to be in the school band. Express these fractions as decimals.



Method 1

Change to a fraction in tenths or hundredths. Then write as a decimal.

$$\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10}$$

$$\frac{4}{10} = 0.4$$

Method 2

Divide.

$$\begin{array}{r} 0.625 \\ 8 \overline{)5.000} \\ \underline{-48} \\ 20 \\ \underline{-16} \\ 40 \\ \underline{-40} \\ 0 \end{array}$$

EXERCISES

Write as a decimal.

1. $\frac{2}{10} = 0.2$ 2. $\frac{6}{10} = 0.6$ 3. $\frac{21}{100} = 0.21$ 4. $\frac{7}{100} = 0.07$ 5. $\frac{35}{100} = 0.35$

Write as a fraction with a denominator of 10 and as a decimal.

6. $\frac{1}{5} = \frac{2}{10} = 0.2$ 7. $\frac{1}{2} = \frac{5}{10} = 0.5$ 8. $\frac{7}{5} = \frac{14}{10} = 1.4$ 9. $\frac{5}{2} = \frac{25}{10} = 2.5$

Write as a fraction with a denominator of 100 and as a decimal.

10. $\frac{3}{20} = \frac{15}{100} = 0.15$ 11. $\frac{19}{50} = \frac{38}{100} = 0.38$ 12. $\frac{52}{50} = \frac{104}{100} = 1.04$

Use division to change the fraction to a decimal.

13. $\frac{3}{50} = 0.06$ 14. $\frac{7}{8} = 0.875$ 15. $\frac{7}{4} = 1.75$ 16. $\frac{9}{40} = 0.225$ 17. $\frac{36}{80} = 0.45$
18. $\frac{26}{25} = 1.04$ 19. $\frac{3}{20} = 0.15$ 20. $\frac{17}{25} = 0.68$ 21. $\frac{17}{20} = 0.85$ 22. $\frac{34}{50} = 0.67$

Using the Exercises

- Questions 1 to 9 require the students to rename as decimals common fractions with denominators of 10 and 100.
- Questions 6 to 12 use Method 1 for changing fractions to decimals.
- Questions 13 to 22 use Method 2 for changing fractions to decimals.

PRACTICE

Write as a fraction with a denominator of 10 or 100.

Then write as a decimal.

1. $\frac{2}{5}$ $\frac{4}{10}$ 0.4
2. $\frac{1}{2}$ $\frac{5}{10}$ 0.5
3. $\frac{8}{25}$ $\frac{32}{100}$ 0.32
4. $\frac{13}{50}$ $\frac{26}{100}$ 0.26
5. $\frac{9}{20}$ $\frac{45}{100}$ 0.45
6. $\frac{7}{2}$ $\frac{35}{10}$ 3.5
7. $\frac{9}{5}$ $\frac{18}{10}$ 1.8
8. $\frac{23}{50}$ $\frac{46}{100}$ 0.46
9. $\frac{21}{25}$ $\frac{84}{100}$ 0.84
10. $\frac{19}{20}$ $\frac{95}{100}$ 0.95
11. $\frac{47}{50}$ $\frac{94}{100}$ 0.94
12. $\frac{31}{50}$ $\frac{62}{100}$ 0.62
13. $\frac{32}{25}$ $\frac{128}{100}$ 1.28
14. $\frac{27}{20}$ $\frac{135}{100}$ 1.35
15. $\frac{17}{5}$ $\frac{34}{10}$ 3.4
16. $\frac{61}{50}$ $\frac{122}{100}$ 1.22
17. $\frac{14}{20}$ $\frac{7}{10}$ 0.7
18. $\frac{8}{5}$ $\frac{16}{10}$ 1.6
19. $\frac{18}{25}$ $\frac{72}{100}$ 0.72
20. $\frac{5}{4}$ $\frac{125}{100}$ 1.25

Use division to change the fraction to a decimal.

21. $\frac{5}{8}$ 0.625
22. $\frac{30}{16}$ 1.875
23. $\frac{11}{40}$ 0.275
24. $\frac{9}{20}$ 0.45
25. $\frac{24}{64}$ 0.375
26. $\frac{5}{625}$ 0.008
27. $\frac{27}{40}$ 0.675
28. $\frac{32}{80}$ 0.4
29. $\frac{8}{11}$ 0.72
30. $\frac{23}{30}$ 0.76

Write as a fraction.

31. 0.95 $\frac{95}{100}$
32. 0.8 $\frac{8}{10}$
33. 0.709 $\frac{709}{1000}$
34. 0.1135 $\frac{1135}{10000}$
35. 0.4 $\frac{4}{10}$
36. 0.05 $\frac{5}{100}$
37. 0.017 $\frac{17}{1000}$
38. 0.0006 $\frac{6}{10000}$

39. A survey of 20 students showed that $\frac{3}{4}$ of the students had at least one record, $\frac{3}{5}$ had at least two records and $\frac{7}{20}$ had more than five. Write the survey results in decimal form.
- $\frac{3}{4} = 0.75$ $\frac{3}{5} = 0.6$ $\frac{7}{20} = 0.35$

What's the Score?

Take a survey of the musical interests of 8 students.

Express the results in decimal form in a chart.

Do you like to sing? Do you play a musical instrument?

What instrument do you play? Would you like to be in a band or orchestra?

Would you like to sing in a musical performance?



159

Assigning the Practice

Minimum: 1-15, 21-28, 31-38

Average: 11-28, 31-39

Enriched: 13-39

Reinforcement

1. Change the following fraction families to decimals and observe the patterns made.

- a. $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$
- b. $\frac{1}{10}$, $\frac{2}{10}$, $\frac{3}{10}$, ..., $\frac{10}{10}$
- c. $\frac{1}{8}$, $\frac{2}{8}$, $\frac{3}{8}$, ..., $\frac{8}{8}$
- d. $\frac{1}{16}$, $\frac{2}{16}$, $\frac{3}{16}$, ..., $\frac{16}{16}$

2. Change these fractions to decimals on a calculator.

- a. $\frac{17}{25}$
- b. $\frac{7}{8}$
- c. $\frac{11}{20}$
- d. $\frac{29}{40}$
- e. $\frac{2}{625}$
- f. $\frac{42}{5}$
- g. $\frac{13}{20}$
- h. $\frac{83}{50}$
- i. $\frac{11}{16}$

3. Compare these fractions and decimals and then write a statement about which is easier.

- a. $\frac{2}{4}$ \bigcirc $\frac{3}{8}$
- b. $\frac{3}{4}$ \bigcirc $\frac{3}{5}$
- 0.50 \bigcirc 0.375
- 0.75 \bigcirc 0.60

Enrichment

1. Assign *What's the Score?* at the bottom of page 159.

2. Explain that decimal equivalents of fractions can be of two kinds, **terminating** ($\frac{1}{4} = 0.25$) or **repeating** ($\frac{1}{9} = 0.\bar{1}$).

The bar means it repeats). Have the students tell which kind the following are and investigate the patterns on those that repeat.

- a. $\frac{1}{3}$
- b. $\frac{7}{9}$
- c. $\frac{5}{11}$
- d. $\frac{4}{25}$
- e. $\frac{5}{6}$
- f. $\frac{21}{50}$
- g. $\frac{9}{11}$
- h. $\frac{7}{12}$
- i. $\frac{15}{16}$

Extra Practice

Worksheet A36

Pages 158-159

Write as a fraction with a denominator of 10 or 100.

Then write as a decimal.

1. $\frac{3}{4}$ $\frac{75}{100}$ 0.75
2. $\frac{7}{20}$ $\frac{35}{100}$ 0.35
3. $\frac{6}{25}$ $\frac{24}{100}$ 0.24
4. $\frac{1}{2}$ $\frac{5}{10}$ 0.5
5. $\frac{9}{5}$ $\frac{18}{10}$ 1.8
6. $\frac{46}{50}$ $\frac{92}{100}$ 0.92
7. $\frac{17}{4}$ $\frac{425}{100}$ 4.25
8. $\frac{19}{20}$ $\frac{95}{100}$ 0.95

Use division to change the fraction to a decimal.

9. $\frac{7}{4}$ 1.75
10. $\frac{21}{3}$ 7
11. $\frac{13}{20}$ 0.65
12. $\frac{26}{80}$ 0.325
13. $\frac{14}{25}$ 0.56
14. $\frac{11}{16}$ 0.6875
15. $\frac{15}{8}$ 1.875
16. $\frac{42}{12}$ 3.5

Write as a fraction.

7. 0.7 $\frac{7}{10}$
18. 0.19 $\frac{19}{100}$
19. 0.421 $\frac{421}{1000}$
20. 0.7253 $\frac{7253}{10000}$
1. 0.08 $\frac{8}{100}$
22. 0.045 $\frac{45}{1000}$
23. 0.002 $\frac{2}{1000}$
24. 0.0016 $\frac{16}{10000}$

Objective A37

Find the fractional part of a set using a unit fraction.

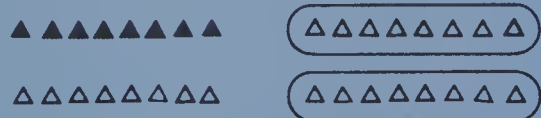
Introducing the Lesson

Discuss which musical instruments belong to the group called strings. Ask the students to pick out the string instruments in the drawing on page 160.

Teaching the Lesson

Draw two sets of 16 triangles on the chalkboard. Ask a student to shade half of the triangles in one of the sets. Ask another student to divide the other set of triangles into two parts.

Point out that the result of $\frac{1}{2}$ of 16 and the result of $\frac{16}{2}$ is the same.



$$\frac{1}{2} \text{ of } 16 = 8$$

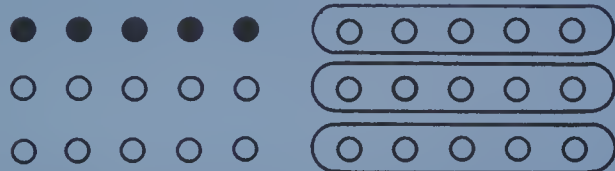
$$\frac{16}{2}$$

$$\text{or } \frac{1}{2} \times 16 = 8$$

Explain that $\frac{1}{2}$ of 16 = $\frac{1}{2} \times 16$ and that both are equal to $\frac{16}{2} = 8$.

Draw two sets of 15 circles on the chalkboard. Have a student shade a third of one set and another student divide the other set into three parts. Compare the results. Let the students

conclude that $\frac{1}{3}$ of 15 = $\frac{1}{3} \times 15 = \frac{15}{3} = 5$.



$$\frac{1}{3} \text{ of } 15 = 5$$

$$\text{or } \frac{1}{3} \times 15 = 5$$

$$\frac{15}{3} = 5$$

Continue illustrating unit fractional parts of sets. Show these equalities.

$$\frac{1}{5} \text{ of } 25 = \frac{1}{5} \times 25 = \frac{25}{5}$$

Then mix the unit fractions used and have the students find the results without illustrations. Soon the students should realize that the results can most easily be found by thinking of the related division.

$$\frac{1}{8} \times 32 \rightarrow \frac{32}{8} = 4$$

Part of a Set



$\frac{1}{3}$ of the instruments in the orchestra are strings.

$$\frac{1}{3} \text{ of } 15 \quad \text{or} \quad \frac{1}{3} \times 15 \quad \text{equals} \quad \frac{15}{3} = 5$$

5 of the instruments are strings.

EXERCISES

Copy and complete

1. $\triangle \triangle \triangle$
 $\triangle \triangle \triangle$

$$\frac{1}{3} \text{ of } 6 = \blacksquare 2$$

2. $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$
 $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$

$$\frac{1}{5} \text{ of } 10 = \blacksquare 2$$

3. $\square \square \square \square \square$
 $\square \square \square \square \square$

$$\frac{1}{3} \text{ of } 12 = \blacksquare 4$$

4. $\frac{1}{9} \times 18 = \frac{18}{9} = \blacksquare 2$ 5. $\frac{1}{4} \times 16 = \frac{16}{4} = \blacksquare 4$ 6. $\frac{1}{6} \times 30 = \frac{30}{6} = \blacksquare 5$

7. $\frac{1}{10} \times 20 = \frac{20}{10} = \blacksquare 2$ 8. $\frac{1}{8} \times 24 = \frac{24}{8} = \blacksquare 3$ 9. $\frac{1}{7} \times 7 = \frac{7}{7} = \blacksquare 1$

Multiply

10. $\frac{1}{2} \times 18$ 9 11. $\frac{1}{10} \times 30$ 3 12. $\frac{1}{6} \times 12$ 2 13. $\frac{1}{5} \times 20$ 4

14. $\frac{1}{4} \times 48$ 12 15. $\frac{1}{7} \times 35$ 5 16. $\frac{1}{20} \times 80$ 4 17. $\frac{1}{25} \times 75$ 3

Using the Exercises

- Questions 1 to 3 require the students to write fractional parts of a set with the aid of illustrations.
- Questions 4 to 9 give the students some help with the multiplications.
- In questions 10 to 17, students must do all the work on their own. Encourage them to think of the related division as they find the products.

PRACTICE

Copy and complete

1. $\frac{1}{5} \times 25 = \frac{25}{5} = \blacksquare **5** 2. $\frac{1}{7} \times 56 = \frac{56}{7} = \blacksquare **8** 3. $\frac{1}{3} \times 24 = \frac{24}{3} = \blacksquare **8**
 4. $\frac{1}{9} \times 27 = \frac{27}{9} = \blacksquare **3** 5. $\frac{1}{12} \times 36 = \frac{36}{12} = \blacksquare **3** 6. $\frac{1}{8} \times 32 = \frac{32}{8} = \blacksquare **4**$$$$$$

Multiply.

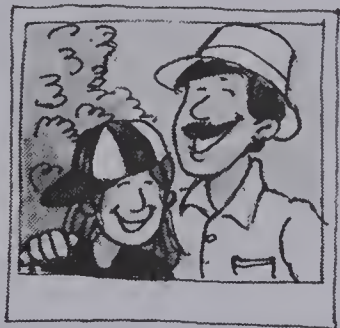
7. $\frac{1}{4} \times 44$ **11** 8. $\frac{1}{6} \times 72$ **12** 9. $\frac{1}{5} \times 45$ **9** 10. $\frac{1}{7} \times 49$ **7**
 11. $\frac{1}{3} \times 21$ **7** 12. $\frac{1}{2} \times 120$ **60** 13. $\frac{1}{9} \times 72$ **8** 14. $\frac{1}{4} \times 28$ **7**
 15. $\frac{1}{5} \times 55$ **11** 16. $\frac{1}{8} \times 64$ **8** 17. $\frac{1}{10} \times 150$ **15** 18. $\frac{1}{2} \times 44$ **22**
 19. $\frac{1}{4} \times 60$ **15** 20. $\frac{1}{5} \times 75$ **15** 21. $\frac{1}{8} \times 80$ **10** 22. $\frac{1}{12} \times 84$ **7**

Solve.

23. Grade 6 students sold 556 tickets for the school play. One half of the tickets were for the opening night. How many tickets did they sell for opening night? **278**
 24. Gerard practises the piano for 45 min daily. For $\frac{1}{5}$ of this time he practises scales. How long does he practise scales each day? **9 min**
 25. One third of 60 students have radios. How many is that? **20**

Catching Up

Joan's age is $\frac{1}{3}$ of her father's age.
 Six years ago, she was $\frac{1}{5}$ of her father's age.
 How old is Joan now? **12**



161

Assigning the Practice

Minimum: 1-18, 23

Average: 7-25

Enriched: 7-25

Reinforcement

1. Ask the students to follow these directions.

Sketch 36 small circles. Colour $\frac{1}{3}$ of the circles red, $\frac{1}{4}$ of the circles blue, and $\frac{1}{6}$ of the circles yellow. What fraction are not coloured?

2. Find the missing numbers.

- a. $\frac{1}{3}$ of $\blacksquare = 3$ b. $\frac{1}{2}$ of $\blacksquare = 6$
 c. $\frac{1}{4}$ of $\blacksquare = 3$ d. \blacksquare of 16 = 4
 e. \blacksquare of 12 = 3 f. \blacksquare of 24 = 3
 g. \blacksquare of 40 = 4 h. $\frac{1}{20}$ of $\blacksquare = 4$

3. Determine the number of minutes in $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, and $\frac{1}{10}$ of an hour.

Enrichment

1. Assign *Catching Up* at the bottom of page 161.

2. Have the students solve this problem.

\$72.00 is to be shared as follows:

Dean receives $\frac{1}{4}$

Ida receives $\frac{1}{3}$

Iona receives $\frac{1}{12}$

Warren receives $\frac{1}{6}$

Leon receives the rest.

Who received the most money?

Who received the least money?

Extra Practice

Worksheet A37

Pages 160-161

Multiply.

1. $\frac{1}{5}$ of 30 **6** 2. $\frac{1}{4}$ of 28 **7** 3. $\frac{1}{10}$ of 100 **10** 4. $\frac{1}{6}$ of 42 **7**
 5. $\frac{1}{3} \times 30$ **10** 6. $\frac{1}{2} \times 50$ **25** 7. $\frac{1}{7} \times 49$ **7** 8. $\frac{1}{8} \times 72$ **9**
 9. $\frac{1}{9} \times 36$ **4** 10. $\frac{1}{12} \times 48$ **4** 11. $\frac{1}{20} \times 40$ **2** 12. $\frac{1}{2} \times 40$ **20**
 13. $\frac{1}{5} \times 60$ **12** 14. $\frac{1}{3} \times 60$ **20** 15. $\frac{1}{10} \times 80$ **8** 16. $\frac{1}{4} \times 44$ **11**

Solve

7. Of the 36 students in the band, $\frac{1}{3}$ are boys. How many boys are in the band? **12**
 8. Six of the 36 band members play drums. What fraction play drums? **$\frac{1}{6}$**

Objective A38

Find the fractional part of a set using more than a unit fraction.

Introducing the Lesson

Ask the students to write the fractions

$\frac{6}{1}$, $\frac{10}{1}$, $\frac{5}{1}$, and $\frac{8}{1}$ as whole numbers.

(Since $\frac{6}{1}$ means $6 \div 1$, then $\frac{6}{1} = 6$,

$\frac{10}{1} = 10$, etc.).

Have the students express 18, 4, 42, 85, 13, and 2 as fractions in simplest terms.

($\frac{18}{1}$, $\frac{4}{1}$, $\frac{42}{1}$, etc.).

Show the students that the multiplication

$\frac{1}{4} \times 28$ can also be written as

$\frac{1}{4} \times \frac{28}{1}$ or $\frac{1 \times 28}{4}$. Explain that since

$28 = \frac{28}{1}$, it is written as a numerator.

$\frac{1}{4} \times 28 \rightarrow \frac{28}{4} = 7$ or $\frac{1 \times 28}{4} = \frac{28}{4} = 7$

Teaching the Lesson

Discuss the lesson example at the top of page 162. Explain that 20 is the same as $\frac{20}{1}$, so the whole number 20 can be written as a numerator. Write the problem on the chalkboard in the following way.

$$\frac{3}{4} \times \frac{20}{1} = \frac{3 \times 20}{4} = \frac{60}{4} = 15$$

Stress that we multiply numerator times numerator and denominator times denominator. Use an illustration to check the calculations. Show, also, the other members of the *family* of multiplications. Note the counting pattern.

$$\times \times \times \times \times \quad \frac{1}{4} \times 20 = 5$$

$$\times \times \times \times \times \quad \frac{2}{4} \times 20 = 10$$

$$\times \times \times \times \times \quad \frac{3}{4} \times 20 = 15$$

$$\times \times \times \times \times \quad \frac{4}{4} \times 20 = 20$$

Write several other examples on the chalkboard. Have the students solve them arithmetically. Then they can illustrate the examples and write the other members of the multiplication families.

Fraction of a Set



Three fourths of the singers are girls.

$$\frac{3}{4} \text{ of } 20 \text{ or } \frac{3}{4} \times 20 \text{ equals } \frac{60}{4} = 15$$

15 of the singers are girls.

EXERCISES

Copy and complete.

$$\begin{array}{lll} 1. \frac{1}{4} \text{ of } 8 = \blacksquare 2 & 2. \frac{1}{3} \times 12 = \blacksquare 4 & 3. \frac{1}{5} \times 30 = \blacksquare 6 \\ \frac{2}{4} \text{ of } 8 = \blacksquare 4 & \frac{2}{3} \times 12 = \blacksquare 8 & \frac{2}{5} \times 30 = \blacksquare 12 \\ \frac{3}{4} \text{ of } 8 = \blacksquare 6 & \frac{3}{3} \times 12 = \blacksquare 12 & \frac{3}{5} \times 30 = \blacksquare 18 \\ \frac{4}{4} \text{ of } 8 = \blacksquare 8 & & \frac{4}{5} \times 30 = \blacksquare 24 \\ & & \frac{5}{5} \times 30 = \blacksquare 30 \end{array}$$

$$\begin{array}{ll} 4. \frac{2}{5} \times 15 = \frac{2 \times 15}{5} = \frac{30}{5} = \blacksquare 6 & 5. \frac{3}{4} \times 20 = \frac{3 \times 20}{4} = \frac{60}{4} = \blacksquare 15 \\ 6. \frac{3}{8} \times 16 = \frac{3 \times 16}{8} = \frac{48}{8} = \blacksquare 6 & 7. \frac{5}{7} \times 21 = \frac{5 \times 21}{7} = \frac{105}{7} = \blacksquare 15 \\ 8. \frac{5}{6} \times 12 = \frac{5 \times 12}{6} = \frac{60}{6} = \blacksquare 10 & 9. \frac{4}{5} \times 20 = \frac{4 \times 20}{5} = \frac{80}{5} = \blacksquare 16 \end{array}$$

Multiply.

$$\begin{array}{llll} 10. \frac{2}{3} \times 9 = 6 & 11. \frac{3}{5} \times 25 = 15 & 12. \frac{2}{7} \times 14 = 4 & 13. \frac{5}{8} \times 32 = 20 \\ 14. \frac{1}{6} \times 18 = 3 & 15. \frac{4}{8} \times 32 = 16 & 16. \frac{1}{7} \times 42 = 6 & 17. \frac{2}{3} \times 54 = 36 \end{array}$$

Using the Exercises

- Questions 1 to 3 have the students solve *families* of multiplications. Students should see the counting patterns in the products.
- Questions 4 to 9 give the students some help with the multiplications.
- Students must do all work in questions 10 to 17 on their own.

PRACTICE

Multiply.

1. $\frac{3}{5} \times 15$ **9**
2. $\frac{3}{8} \times 16$ **6**
3. $\frac{4}{7} \times 21$ **12**
4. $\frac{7}{8} \times 32$ **28**
5. $\frac{7}{10} \times 20$ **14**
6. $\frac{5}{6} \times 42$ **35**
7. $\frac{2}{9} \times 27$ **6**
8. $\frac{4}{5} \times 50$ **40**
9. $\frac{3}{7} \times 77$ **33**
10. $\frac{3}{4} \times 48$ **36**
11. $\frac{2}{3} \times 60$ **40**
12. $\frac{3}{5} \times 40$ **24**
13. $\frac{5}{8} \times 64$ **40**
14. $\frac{7}{9} \times 81$ **63**
15. $\frac{2}{5} \times 100$ **40**
16. $\frac{6}{7} \times 63$ **54**
17. $\frac{4}{5} \times 200$ **160**
18. $\frac{3}{8} \times 72$ **27**
19. $\frac{5}{6} \times 36$ **30**
20. $\frac{5}{9} \times 63$ **35**

Solve.

21. There are 120 seats in the auditorium. $\frac{5}{6}$ of them were filled for a recital. How many people attended the recital? **100**
22. Two fifths of the 300 students in Glen Valley School play the guitar. How many students don't play the guitar? **120**
23. A parade route is 36 blocks long. The Brownie Troop is to march only $\frac{2}{3}$ of the distance. For how many blocks will the Brownies march? **24**

USING THE CALCULATOR

A calculator can be used to multiply a whole number by a fraction.

Try $\frac{5}{8} \times 56$. Enter: 5 \times 56 $=$ \div 8 $=$

Round the answers to the nearest whole number.

1. $\frac{3}{4} \times 10$ **8**
2. $\frac{3}{8} \times 25$ **9**
3. $\frac{5}{16} \times 78$ **24**
4. $\frac{2}{3} \times 100$ **67**
5. $\frac{2}{7} \times 100$ **29**
6. $\frac{4}{9} \times 100$ **44**

163

Assigning the Practice

Minimum: 1-16, 21

Average: 5-23

Enriched: 5-23

Reinforcement

1. Assign *Using the Calculator* at the bottom of page 163.
2. Draw illustrations that would show the meaning of the following.
 - a. $\frac{2}{3}$ of 12
 - b. $\frac{3}{4}$ of 20
 - c. $\frac{3}{5}$ of 15
 - d. $\frac{3}{7}$ of 21
3. Write comparison statements using $<$, $=$, or $>$ for the following times.

- a. $\frac{4}{5}$ h \bigcirc $\frac{3}{4}$ h
- b. $\frac{7}{10}$ h \bigcirc $\frac{5}{6}$ h
- c. $\frac{2}{5}$ h \bigcirc $\frac{4}{10}$ h
- d. $\frac{1}{2}$ h \bigcirc $\frac{7}{12}$ h
- e. $\frac{2}{3}$ h \bigcirc $\frac{4}{6}$ h
- f. $\frac{2}{4}$ h \bigcirc $\frac{6}{12}$ h

Enrichment

1. Find the missing numbers.

- a. $\frac{\blacksquare}{3}$ of 18 = 12
- b. $\frac{\blacksquare}{4}$ of 32 = 24
- c. $\frac{\blacksquare}{5}$ of 35 = 21
- d. $\frac{\blacksquare}{7}$ of 56 = 24
- e. $\frac{\blacksquare}{\blacksquare}$ of 48 = 30
- f. $\frac{\blacksquare}{\blacksquare}$ of 56 = 49
- g. $\frac{\blacksquare}{\blacksquare}$ of 45 = 25
- h. $\frac{\blacksquare}{\blacksquare}$ of 21 = 9

2. Have the students think of multiplications of a fraction by a whole number that name the following whole numbers.

5
$\frac{1}{2} \times 10$

8
$\frac{2}{3} \times 12$

12
$\frac{4}{5} \times 15$

Extra Practice

Worksheet A38

Pages 162-163

Multiply.

1. $\frac{4}{5} \times 25$ **20**
2. $\frac{2}{9} \times 27$ **6**
3. $\frac{3}{7} \times 21$ **9**
4. $\frac{1}{6} \times 36$ **6**
5. $\frac{7}{10} \times 20$ **14**
6. $\frac{5}{6} \times 36$ **30**
7. $\frac{4}{9} \times 18$ **8**
8. $\frac{2}{5} \times 60$ **24**
9. $\frac{4}{7} \times 42$ **24**
10. $\frac{3}{8} \times 48$ **18**
11. $\frac{1}{4} \times 40$ **10**
12. $\frac{3}{4} \times 16$ **12**
13. $\frac{5}{9} \times 36$ **20**
14. $\frac{5}{8} \times 40$ **25**
15. $\frac{6}{7} \times 14$ **12**
16. $\frac{9}{10} \times 30$ **27**

Solve.

17. Of the 12 saxophones in the band, $\frac{3}{4}$ are alto saxophones. How many alto saxophones are there? **9**

Objective PS6

Identify extraneous information and insufficient information in word problems.

Introducing the Lesson

Review the four problem-solving steps (**Identify, Decide, Evaluate, Answer**) as the students solve these problems.

- Two-thirds of the 360 spectators at a soccer game were students. How many spectators were students?
- John and Bill each received \$36 for their birthdays. John has $\frac{5}{9}$ of his money left. Bill has $\frac{7}{12}$ of his money left. Who has more money left?

Teaching the Lesson

Discuss the problem at the top left of page 164. As you use the four problem-solving steps to solve the problem, let the students discover that not enough information is given. Ask what facts could be added to the problem so it could be solved.

Read and discuss the problem at the top right of page 164. As you talk about the first problem-solving step, *identify the facts*, the students should see that too many facts are given. Sort out the necessary facts and then solve the problem using the remaining three problem-solving steps.

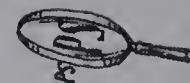
Talk about the facts needed for various problem-solving situations.

- What facts are needed to find the area and perimeter of a rectangle? of a circle?
- What facts are needed to find the time it takes to fly from Montreal to Vancouver?
- What facts are needed to find the number of seats in a theatre?

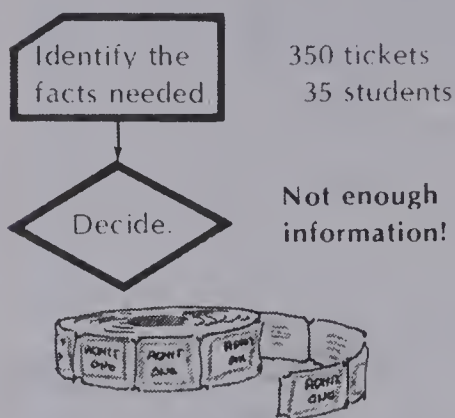
Problem Solving Activities

Assign Level 6, Unit 7

Problem Solving

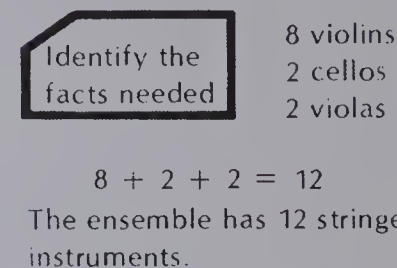


There are 35 students in Grade 6. They sold 350 tickets for the spring concert. How much money did they make?



An ensemble has 8 violins, 3 clarinets, 2 cellos, 2 flutes, 1 oboe, 2 violas, and a French horn. How many stringed instruments does it have?

Too much information!



EXERCISES

Is there too much information, just enough information, or not enough information?

- Butter tarts sell for \$3.50 a dozen. What is the price of 12 butter tarts packed in 4 rows of 3? **Too much**
- How much does it cost to buy 5 pairs of tickets to the school dance? **Not enough**
- What is the cost of a dozen paperback books if each book costs \$1.95? **Just enough**
- Potatoes cost 30¢/kg. How much does it cost to buy a 5 kg bag containing 20 potatoes? **Too much**
- An antique store owner sold a violin for \$50 and bought it back for \$30. Then she resold it for \$40. What is her net gain or loss on the violin? **Just enough**

Using the Exercises

- Questions 1 to 5 require students to read a problem, identify the facts needed, and then decide if there are too many facts, not enough facts, or just enough facts given. For practice, the students can solve the problems that have enough information.

PRACTICE

Solve only the problems which have all the facts needed.

1. Last Saturday 480 people attended a band concert in Nelson. If everyone came by car, how many cars were in the parking lot?
2. Fanny rents her flea market space for \$15 a square metre. How much area should she pay for if her booth is 3 m high, 2 m wide, and 4 m long? $8 \text{ m}^2 = \$120$
3. Markham High School held their annual concert and charged \$2 admission for adults and \$1 admission for children. How many adults and children attended the concert if the total receipts were \$300?
4. Over a weekend, Cindy's Record Shop sold \$1278 worth of records to 120 people and made a profit of \$356. She sold 165 LPs and 38 singles. How much did it cost to run the store for the weekend? $\$922$

REVIEW

Write as a fraction.

- N13 1. $5\frac{3}{4}$ $\frac{23}{4}$ 2. $9\frac{5}{6}$ $\frac{59}{6}$ 3. $2\frac{4}{5}$ $\frac{14}{5}$ 4. $6\frac{1}{2}$ $\frac{13}{2}$

Write as a mixed numeral.

- N14 5. $\frac{15}{8}$ $1\frac{7}{8}$ 6. $\frac{5}{2}$ $2\frac{1}{2}$ 7. $\frac{11}{3}$ $3\frac{2}{3}$ 8. $\frac{27}{4}$ $6\frac{3}{4}$

Write as a decimal.

- A36 9. $\frac{9}{10}$ 0.9 10. $\frac{3}{4}$ 0.75 11. $\frac{11}{50}$ 0.22 12. $\frac{16}{25}$ 0.64

Multiply.

- A37 13. $\frac{1}{5} \times 35$ 7 14. $\frac{1}{3} \times 42$ 14 15. $\frac{1}{8} \times 64$ 8
A38 16. $\frac{3}{4} \times 28$ 21 17. $\frac{2}{3} \times 30$ 20 18. $\frac{5}{9} \times 36$ 20

165

Assigning the Practice

Minimum: 1-4

Average: 1-4

Enriched: 1-4

Review Exercises

Questions	Objective	Pages
1-4	N13	154-155
5-8	N14	156-157
9-12	A36	158-159
13-15	A37	160-161
16-18	A38	162-163

Reinforcement

1. Write the following facts on the chalkboard. Ask the students to:

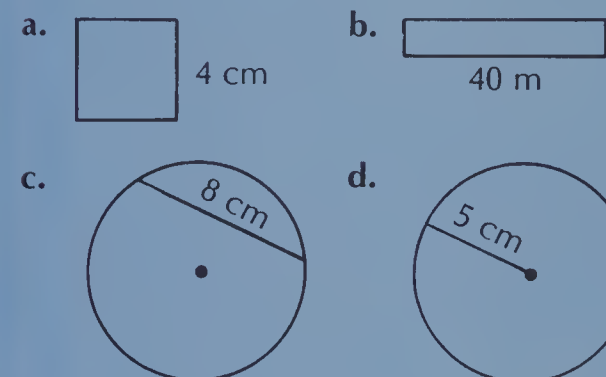
a. make up three different problems from the data.

b. make up two problems with too many facts and two problems with not enough facts.

Have the students exchange problems and then solve them.

Theatre Tickets	
Adult:	\$6.50
Student: (12-18 years)	\$4.50
Child: (under 12 years)	\$3.50
Senior citizen (over 60 years)	\$2.50

2. Find the areas of those figures below which have sufficient information.



Enrichment

Give each student a department store catalog. Ask them to make up problems dealing with money, mass, and length. Compile the problems for future problem-solving activities.

Extra Practice

Worksheet PS6

Pages 164-165

Solve only the problems which have all the needed facts.

1. A shop owner earned a profit of \$1500 in January, \$2300 in February, \$2150 in March, and \$1875 in April. What was her profit for the first third of the year? $\$7825$
2. It takes Paula $\frac{3}{4}$ of an hour to shovel the Huber's driveway. How much does she earn, if she is paid \$2.00 per hour? $\$1.50$
3. Mr. Gould had a two hour wait between planes. He spent 45 minutes having lunch, 30 minutes reading the newspaper, and 45 minutes looking around. If his wait started at 16:05, what time was his next plane? $18:05$
4. Marie gets \$2.00 a week for work she does around the house. She earns \$1.50 an hour for babysitting. How much money does she earn in a week?

Unit 7 Objective	Test Questions	Pages
N11	1-3	146-147
A34	4-7	148-149
A35	8-12	150-151
N12	13-16	152-153
N13	17-21	154-155
N14	22-26	156-157
A36	27-31	158-159
A37	32-35	160-161
A38	36-39	162-163
PS	40	164-165

TEST

UNIT 7

What fraction of the set is shaded?



Copy and complete.

4. $\frac{2}{3} = \frac{10}{15}$ 5. $\frac{4}{9} = \frac{16}{36}$ 6. $\frac{1}{5} = \frac{7}{35}$ 7. $\frac{6}{7} = \frac{18}{21}$

Write in simplest terms.

8. $\frac{8}{10} \frac{4}{5}$ 9. $\frac{6}{12} \frac{1}{2}$ 10. $\frac{18}{21} \frac{6}{7}$ 11. $\frac{15}{40} \frac{3}{8}$ 12. $\frac{14}{35} \frac{2}{5}$

Copy and complete. Write $>$ or $<$.

13. $\frac{1}{2} < \frac{3}{4}$ 14. $\frac{5}{6} < \frac{11}{12}$ 15. $\frac{3}{5} < \frac{7}{10}$ 16. $\frac{2}{3} < \frac{5}{6}$

Change the mixed numeral to a fraction.

17. $3\frac{1}{2} \frac{7}{2}$ 18. $5\frac{2}{3} \frac{17}{3}$ 19. $8\frac{1}{4} \frac{33}{4}$ 20. $9\frac{2}{5} \frac{47}{5}$ 21. $3\frac{5}{8} \frac{29}{8}$

Change the fraction to a mixed numeral.

22. $\frac{15}{7} 2\frac{1}{7}$ 23. $\frac{19}{5} 3\frac{4}{5}$ 24. $\frac{8}{3} 2\frac{2}{3}$ 25. $\frac{21}{10} 2\frac{1}{10}$ 26. $\frac{48}{9} 5\frac{3}{9}$

Write as a decimal.

27. $\frac{2}{10} 0.2$ 28. $\frac{79}{100} 0.79$ 29. $\frac{4}{25} 0.16$ 30. $\frac{21}{50} 0.42$ 31. $\frac{3}{8} 0.375$

Multiply.

32. $\frac{1}{6} \times 18 3$ 33. $\frac{1}{4} \times 32 8$ 34. $\frac{1}{9} \times 81 9$ 35. $\frac{1}{5} \times 45 9$
36. $\frac{3}{4} \times 12 9$ 37. $\frac{5}{7} \times 35 25$ 38. $\frac{3}{8} \times 32 12$ 39. $\frac{4}{5} \times 65 52$

Solve.

40. Only three quarters of the band came to practice.
How many of the 36 players were absent? 9

Post-test

Unit 7

What fraction of the set is shaded?



Write the missing numerator or denominator.

4. $\frac{3}{4} = \frac{9}{12}$ 5. $\frac{1}{6} = \frac{4}{24}$ 6. $\frac{5}{7} = \frac{20}{28}$ 7. $\frac{3}{8} = \frac{12}{32}$

Write in simplest terms.

8. $\frac{4}{12} \frac{1}{3}$ 9. $\frac{10}{15} \frac{2}{3}$ 10. $\frac{18}{30} \frac{3}{5}$ 11. $\frac{25}{40} \frac{5}{8}$ 12. $\frac{16}{56} \frac{2}{7}$

Compare using $<$ or $>$.

13. $\frac{1}{5} < \frac{6}{15}$ 14. $\frac{2}{18} < \frac{1}{6}$ 15. $\frac{25}{32} > \frac{3}{4}$ 16. $\frac{5}{9} < \frac{2}{3}$

Change the mixed numeral to a fraction.

17. $2\frac{1}{2} \frac{5}{2}$ 18. $4\frac{3}{4} \frac{19}{4}$ 19. $5\frac{1}{3} \frac{16}{3}$ 20. $6\frac{3}{7} \frac{45}{7}$ 21. $3\frac{3}{10} \frac{33}{10}$

Find the LCM of each pair of numbers.

1. 4 and 6 **12** 2. 9 and 12 **36** 3. 15 and 20 **60**

Is 7924 divisible:

4. by 2? **Yes** 5. by 3? **No** 6. by 4? **Yes** 7. by 5? **No** 8. by 6? **No**

Is 5112 divisible:

9. by 4? **Yes** 10. by 3? **Yes** 11. by 6? **Yes** 12. by 9? **Yes** 13. by 10? **No**

Find the GCF of each pair of numbers.

14. 12 and 18 **6** 15. 14 and 21 **7** 16. 18 and 36 **18**

Is the number prime or composite?

17. 2 **Prime** 18. 9 **Comp.** 19. 15 **Comp.** 20. 30 **Comp.** 21. 43 **Prime**

Use a factor tree to write each number as a product of prime factors. Write the product using exponents.

22. 15 **3×5** 23. 40 **$2^3 \times 5$** 24. 32 **2^5** 25. 36 **$3^2 \times 2^2$** 26. 60 **$5 \times 3 \times 2^2$**

Simplify each expression.

27. $70 + 40 \div 5$ **78** 28. $65 - 18 + 12 \div 4$ **50**
29. $48 \div (16 - 4)$ **4** 30. $(3 + 7) \times (14 - 2)$ **120**

What is N ? Check your answer.

31. $N - 57 = 38$ 32. $N \times 15 = 120$ 33. $N \div 12 = 13$

Copy and complete.

34.	<table border="1"> <tr><th>In</th><th>Out</th></tr> <tr><td>N</td><td>$N - 24$</td></tr> <tr><td>61</td><td>37</td></tr> <tr><td>92</td><td>68</td></tr> <tr><td>108</td><td>84</td></tr> </table>	In	Out	N	$N - 24$	61	37	92	68	108	84
In	Out										
N	$N - 24$										
61	37										
92	68										
108	84										
35.	<table border="1"> <tr><th>In</th><th>Out</th></tr> <tr><td>N</td><td>$60 \div (N + 3)$</td></tr> <tr><td>9</td><td>5</td></tr> <tr><td>12</td><td>4</td></tr> <tr><td>27</td><td>2</td></tr> </table>	In	Out	N	$60 \div (N + 3)$	9	5	12	4	27	2
In	Out										
N	$60 \div (N + 3)$										
9	5										
12	4										
27	2										
36.	<table border="1"> <tr><th>In</th><th>Out</th></tr> <tr><td>N</td><td>$100 - N \div 2$</td></tr> <tr><td>26</td><td>87</td></tr> <tr><td>38</td><td>81</td></tr> <tr><td>100</td><td>50</td></tr> </table>	In	Out	N	$100 - N \div 2$	26	87	38	81	100	50
In	Out										
N	$100 - N \div 2$										
26	87										
38	81										
100	50										

Change the fraction to a mixed numeral.

22. $\frac{6}{4}$ **$1\frac{2}{4}$** 23. $\frac{7}{3}$ **$2\frac{1}{3}$** 24. $\frac{18}{4}$ **$4\frac{2}{4}$** 25. $\frac{32}{5}$ **$6\frac{2}{5}$** 26. $\frac{70}{10}$ **7**

Write as a decimal.

27. $\frac{3}{10}$ **0.3** 28. $\frac{23}{100}$ **0.23** 29. $\frac{3}{20}$ **0.15** 30. $\frac{13}{50}$ **0.26** 31. $\frac{7}{8}$ **0.875**

Multiply.

32. $\frac{1}{3} \times 30$ **10** 33. $\frac{1}{4} \times 36$ **9** 34. $\frac{1}{7} \times 35$ **5** 35. $\frac{1}{6} \times 66$ **11**
36. $\frac{3}{4} \times 16$ **12** 37. $\frac{2}{7} \times 21$ **6** 38. $\frac{5}{8} \times 24$ **15** 39. $\frac{5}{6} \times 36$ **30**

Solve

40. Leonard bought 2 records and 3 blank tapes for \$23.50. How much did the tapes cost?
Insufficient information
How much for each tape?

UNIT 8

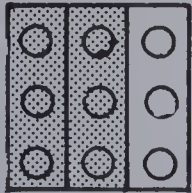

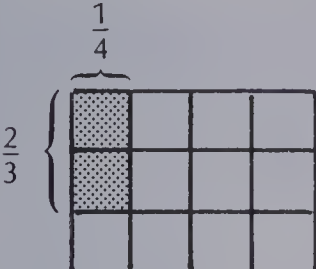

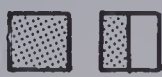
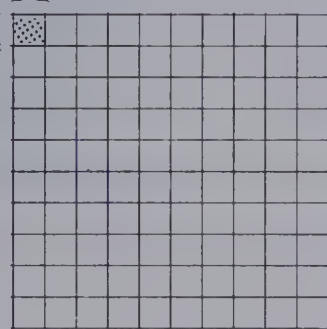
Multiplication with Fractions and Decimals

Theme: Business and Industry

Lesson	Objective		Pages
Preview		Review simplifying mixed numerals and writing fractions as mixed numerals.	169
1	A39	Multiply a fraction and a whole number.	170-171
2	A40	Multiply a fraction by a fraction.	172-173
3	A41	Multiply a mixed numeral by a fraction or a whole number.	174-175
4	PS7	Use formulas to find the measurements of geometric figures.	176-177
5	A42	Multiply a decimal greater than 1 by a whole number.	178-179
6	A43	Multiply a decimal less than 1 in tenths by a decimal in the same form.	180-181
7	A44	Multiply a decimal greater than 1 in tenths by a decimal in the same form.	182-183
8	A45	Multiply a decimal less than 1 in hundredths by a decimal less than 1 in tenths.	184-185
9	A46	Multiply a decimal greater than 1 in hundredths by a decimal greater than 1 in tenths.	186-187
10	PS8	Make a table or diagram to help solve a word problem.	188-189
Test		Multiplication with Fractions and Decimals	190
Review		Fractions	191

About This Unit

The aim of this unit is to improve multiplication skills with fractions and decimals. The picture models which have been suggested in nearly every lesson are of great importance to student success with this unit. These should help students to visualize the concepts and verify the procedures. For example:

- a.  $\frac{2}{3}$ of 9
 $\frac{2}{3} \times 9 = \frac{18}{3} = 6$
- b.  $5 \times \frac{3}{4} = \frac{15}{4} = 3 \frac{3}{4}$
- c.  $\frac{2}{3} \times \frac{1}{4} = \frac{2}{12}$
- d.  $3 \times 1 \frac{1}{2}$
 $3 \times \frac{3}{2} = \frac{9}{2} = 4 \frac{1}{2}$
- e.  $0.1 \times 0.1 =$
 $\frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$
 0.01

Since the meaning behind multiplication with fractions and decimals is often misunderstood by students, it is advisable to use picture models at the outset as often as possible. Only when the meaning behind the multiplications is thoroughly understood can students be completely successful with the algorithm procedure.

Estimation is emphasized in this unit. Its application for checking the reasonableness of answers is frequently required. This can be especially important in verifying the position of

the decimal point in a product.

The application of multiplication skills with fractions and decimals in solving real-life problem situations is presented in each lesson. It is especially emphasized in Lesson 4 in which students work from formulas involving multiplication to find various measurements of geometric figures. After solving these kinds of problems, the various multiplication skills learned in this unit should be more meaningful to the students.

Ideas

Plan a lesson that introduces the students to the stock market. Since this is an area where fractions are commonly used, explain the features of the newspaper's daily stock market report. Have the class choose 4 or 5 stocks to watch each day for a week or more. Discuss the prices of these stocks and their daily rise or fall. Plot these developments on a chalkboard graph.

UNIT 8

MULTIPLICATION WITH FRACTIONS & DECIMALS



Unit 8 Objective	Test Questions	Pages
A39	1-4	170-171
A40	5-8	172-173
A41	9-12	174-175
A42	13-16	178-179
A43	17-20	180-181
A44	21-24	182-183
A45	25-28	184-185
A46	29-32	186-187
PS	33-34	

Pretest

Unit 8

Multiply. Write the answer in simplest terms.

- $\frac{2}{3} \times 24 = \underline{16}$
- $20 \times \frac{3}{5} = \underline{12}$
- $\frac{5}{8} \times 32 = \underline{20}$
- $\frac{3}{4} \times 30 = \underline{22\frac{1}{2}}$
- $\frac{3}{4} \times \frac{8}{9} = \underline{\frac{2}{3}}$
- $\frac{2}{5} \times \frac{6}{7} = \underline{\frac{12}{35}}$
- $\frac{3}{10} \times \frac{2}{9} = \underline{\frac{1}{15}}$
- $\frac{1}{25} \times \frac{8}{2} = \underline{\frac{4}{25}}$
- $10 \times 2\frac{1}{2} = \underline{25}$
- $\frac{2}{7} \times 1\frac{1}{4} = \underline{5\frac{1}{4}}$
- $3\frac{2}{3} \times 4 = \underline{14\frac{2}{3}}$
- $1\frac{2}{5} \times 5 = \underline{7}$

Find the product.

- $\begin{array}{r} 2.4 \\ \times 18 \\ \hline 43.2 \end{array}$
- $\begin{array}{r} 3.15 \\ \times 6 \\ \hline 18.9 \end{array}$
- $\begin{array}{r} 8.019 \\ \times 27 \\ \hline 216.513 \end{array}$
- $\begin{array}{r} 6.43 \\ \times 83 \\ \hline 533.69 \end{array}$
- $\begin{array}{r} 0.7 \\ \times 0.2 \\ \hline 0.14 \end{array}$
- $\begin{array}{r} 0.3 \\ \times 0.8 \\ \hline 0.24 \end{array}$
- $\begin{array}{r} 0.1 \\ \times 0.1 \\ \hline 0.01 \end{array}$
- $\begin{array}{r} 0.9 \\ \times 0.6 \\ \hline 0.54 \end{array}$

Suggestions

Ask the students if they have heard stock reports given on the radio or television. Point out how stock reports are given in fractions. A person who keeps track of investments needs to know what the fractions mean and how to calculate with them.

About the Page

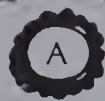
The two activities on page 169 are designed to provide the students with practice in simplifying fractions and in writing fractions as mixed numerals. Both of these skills are needed in developing and using the algorithms for multiplying fractions.

As the students complete the two sets of activities, they should realize that the answers in set A are the same as those in set B. Hence, the exercises are self-checking.

Reinforcement

Ask the students to write two or more names for the following values. For example, $2\frac{3}{4}$ or $\frac{11}{4}$ or $2 + \frac{3}{4}$ or $\frac{5}{4} + \frac{6}{4}$

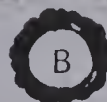
- | | | |
|-------------------|-------------------|-------------------|
| a. $1\frac{1}{2}$ | b. $2\frac{1}{4}$ | c. $\frac{5}{4}$ |
| d. $\frac{12}{3}$ | e. $\frac{7}{7}$ | f. $3\frac{1}{3}$ |
| g. $\frac{4}{5}$ | h. $\frac{6}{10}$ | i. $\frac{15}{2}$ |



1000 shares Consolidated Fractions A

Simplify the mixed numeral.

- | | | |
|-------------------------------------|-------------------------------------|-------------------------------------|
| 1. $5\frac{5}{10}$ $5\frac{1}{2}$ | 2. $7\frac{12}{20}$ $7\frac{3}{5}$ | 3. $2\frac{9}{24}$ $2\frac{3}{8}$ |
| 4. $5\frac{10}{24}$ $5\frac{5}{12}$ | 5. $3\frac{4}{16}$ $3\frac{1}{4}$ | 6. $3\frac{12}{16}$ $3\frac{3}{4}$ |
| 7. $7\frac{27}{30}$ $7\frac{9}{10}$ | 8. $2\frac{20}{24}$ $2\frac{5}{6}$ | 9. $5\frac{8}{24}$ $5\frac{1}{3}$ |
| 10. $7\frac{20}{30}$ $7\frac{2}{3}$ | 11. $6\frac{15}{24}$ $6\frac{5}{8}$ | 12. $9\frac{6}{24}$ $9\frac{1}{4}$ |
| 13. $8\frac{8}{10}$ $8\frac{4}{5}$ | 14. $4\frac{21}{28}$ $4\frac{3}{4}$ | 15. $1\frac{40}{45}$ $1\frac{8}{9}$ |



1000 shares Consolidated Fractions B

Write the fraction as a mixed numeral.

- | | | |
|------------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{11}{2}$ $5\frac{1}{2}$ | 2. $\frac{38}{5}$ $7\frac{3}{5}$ | 3. $\frac{19}{8}$ $2\frac{3}{8}$ |
| 4. $\frac{65}{12}$ $5\frac{5}{12}$ | 5. $\frac{13}{4}$ $3\frac{1}{4}$ | 6. $\frac{15}{4}$ $3\frac{3}{4}$ |
| 7. $\frac{79}{10}$ $7\frac{9}{10}$ | 8. $\frac{17}{6}$ $2\frac{5}{6}$ | 9. $\frac{16}{3}$ $5\frac{1}{3}$ |
| 10. $\frac{23}{3}$ $7\frac{2}{3}$ | 11. $\frac{53}{8}$ $6\frac{5}{8}$ | 12. $\frac{37}{4}$ $9\frac{1}{4}$ |
| 13. $\frac{44}{5}$ $8\frac{4}{5}$ | 14. $\frac{19}{4}$ $4\frac{3}{4}$ | 15. $\frac{17}{9}$ $1\frac{8}{9}$ |

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- | | | | |
|---|---|--|--|
| 21. $\begin{array}{r} 2.5 \\ \times 6.3 \\ \hline 15.75 \end{array}$ | 22. $\begin{array}{r} 8.2 \\ \times 1.2 \\ \hline 9.84 \end{array}$ | 23. $\begin{array}{r} 3.7 \\ \times 4.5 \\ \hline 16.65 \end{array}$ | 24. $\begin{array}{r} 6.9 \\ \times 3.6 \\ \hline 24.84 \end{array}$ |
| 25. $\begin{array}{r} 0.02 \\ \times 0.7 \\ \hline 0.014 \end{array}$ | 26. $\begin{array}{r} 0.07 \\ \times 0.3 \\ \hline 0.021 \end{array}$ | 27. $\begin{array}{r} 0.15 \\ \times 0.9 \\ \hline 0.135 \end{array}$ | 28. $\begin{array}{r} 0.84 \\ \times 0.7 \\ \hline 0.588 \end{array}$ |
| 29. $\begin{array}{r} 416 \\ \times 2.5 \\ \hline 10.400 \end{array}$ | 30. $\begin{array}{r} 3.85 \\ \times 1.7 \\ \hline 6.545 \end{array}$ | 31. $\begin{array}{r} 8.02 \\ \times 3.3 \\ \hline 26.466 \end{array}$ | 32. $\begin{array}{r} 6.91 \\ \times 4.6 \\ \hline 31.786 \end{array}$ |

Solve.

3. If a car is travelling at 96 km/h, how long will it take the car to go 144 km? 384 km? 504 km?
 $1\frac{1}{2} \text{ h}$ 4 h $5\frac{1}{4} \text{ h}$
4. Estimate the cost of 2.3 km of apples, if the price is \$1.87/kg.
 Find the exact amount. $\$4.30$

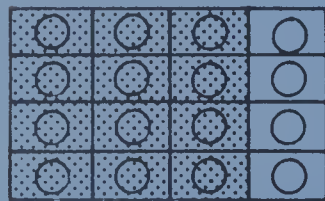
UNIT 8 LESSON 1

Objective A39

Multiply a fraction and a whole number.

Introducing the Lesson

Sketch the following diagram. Discuss the multiplication it illustrates.



$$\frac{3}{4} \text{ of } 16 \text{ or } \frac{3}{4} \times 16$$

Since 16 is the same as $\frac{16}{1}$, the multiplication can also be written as

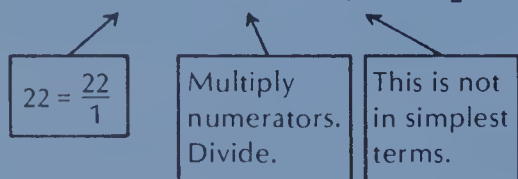
$$\frac{3}{4} \times \frac{16}{1} \text{ or } \frac{3 \times 16}{4} = \frac{48}{4} = 12.$$

Review other examples of a fraction times a whole number yielding a whole number product. Have the students draw a diagram of each example.

Teaching the Lesson

Study the lesson example at the top of page 170 together. Make sure that all students understand the pictograph. Ask the students to find the solution to $\frac{3}{4}$ of 22 by counting the symbols in the shaded area of the diagram. Then explain how the solution to $\frac{3}{4}$ of 22 can be found arithmetically.

$$\frac{3}{4} \times 22 = \frac{3 \times 22}{4} = \frac{66}{4} = 16 \frac{2}{4} = 16 \frac{1}{2}$$



Sketch the following diagram to illustrate $\frac{2}{3}$ of 7. Students are to find the solution by looking at the diagram and then by working it arithmetically.



$$\frac{2}{3} \times 7 = \frac{2 \times 7}{3} = \frac{14}{3} = 4 \frac{2}{3}$$

Review that the order of factors in multiplication can be changed without affecting the product.

$$\text{Hence, } \frac{2}{3} \times 7 = 7 \times \frac{2}{3}.$$

Multiplying With Fractions

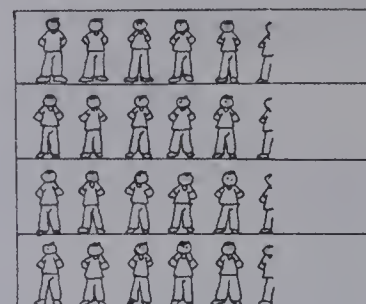
Three fourths of 22 thousand railway workers voted against having a strike. How many thousand railway workers is that?


$$\frac{3}{4} \text{ of } 22 = \blacksquare$$

or

$$\frac{3}{4} \times 22 = \frac{3 \times 22}{4} = \frac{66}{4} = 16 \frac{2}{4} = 16 \frac{1}{2}$$

22 thousand workers



each  represents 1000 railway workers

$16 \frac{1}{2}$ thousand (or 16 500) railway workers voted against the strike.

EXERCISES

Multiply. Write the answer as a mixed numeral.

1. $\frac{1}{8}$ of 9 = $\frac{9}{8} = 1 \frac{1}{8}$
2. $9 \times \frac{5}{8} = \frac{9 \times 5}{8} = 5 \frac{5}{8}$
3. $\frac{3}{5}$ of 2 = $\frac{3 \times 2}{5} = 1 \frac{1}{5}$
4. $4 \times \frac{6}{7} = \frac{4 \times 6}{7} = 3 \frac{3}{7}$
5. $\frac{1}{3}$ of 10 = $3 \frac{1}{3}$
6. $\frac{2}{3}$ of 10 = $6 \frac{2}{3}$
7. $\frac{3}{3}$ of 10 = 10
8. $\frac{4}{3}$ of 10 = $13 \frac{1}{3}$
9. $\frac{1}{4}$ of 14 = $3 \frac{1}{2}$
10. $\frac{2}{4}$ of 14 = 7
11. $\frac{3}{4}$ of 14 = $10 \frac{1}{2}$
12. $\frac{4}{4}$ of 14 = 14
13. $3 \times \frac{1}{2} = 1 \frac{1}{2}$
14. $3 \times \frac{2}{2} = 3$
15. $3 \times \frac{3}{2} = 4 \frac{1}{2}$
16. $3 \times \frac{4}{2} = 6$
17. $\frac{3}{4} \times 6 = 4 \frac{1}{2}$
18. $\frac{5}{7} \times 12 = 8 \frac{4}{7}$
19. $5 \times \frac{3}{10} = 1 \frac{1}{2}$
20. $8 \times \frac{3}{4} = 6$
21. $\frac{5}{6} \times 7 = 5 \frac{5}{6}$
22. $\frac{4}{8} \times 5 = 2 \frac{1}{2}$
23. $\frac{2}{3} \times 6 = 4$
24. $\frac{5}{3} \times 8 = 13 \frac{1}{3}$
25. $\frac{6}{5} \times 4 = 4 \frac{4}{5}$
26. $\frac{3}{7} \times 7 = 3$
27. $\frac{3}{6} \times 8 = 4$
28. $\frac{12}{5} \times 4 = 9 \frac{3}{5}$

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Using the Pages

- Questions 1 to 4 provide students with the method for multiplying a fraction and a whole number.
- Questions 5 to 12 use the word "of" in asking for similar multiplications. The same whole numbers are multiplied by a fraction "family" so that the students can observe the pattern. Ask the students why the products of questions 7 and 10 are the same as one of their factors.
- Questions 13 to 28 involve multiplications of whole numbers by fractions which are sometimes less than and sometimes greater than one whole.

PRACTICE

Multiply. Write the answer in simplest terms.

1. $\frac{1}{6}$ of 70 $11\frac{2}{3}$
2. $\frac{1}{9}$ of 3 $\frac{1}{3}$
3. $3 \times \frac{2}{3}$ 2
4. $5 \times \frac{1}{10}$ $\frac{1}{2}$
5. $\frac{4}{5} \times 10$ 8
6. $\frac{7}{12} \times 4$ $2\frac{1}{3}$
7. $11 \times \frac{7}{8}$ $9\frac{5}{8}$
8. $3 \times \frac{2}{9}$ $\frac{2}{3}$
9. $\frac{2}{3} \times 7$ $4\frac{2}{3}$
10. $\frac{3}{4} \times 24$ 18
11. $\frac{5}{5} \times 4$ 4
12. $\frac{5}{6} \times 9$ $7\frac{1}{2}$
13. $25 \times \frac{7}{10}$ $17\frac{1}{2}$
14. $15 \times \frac{2}{9}$ $3\frac{1}{3}$
15. $12 \times \frac{5}{8}$ $7\frac{1}{2}$
16. $30 \times \frac{1}{12}$ $2\frac{1}{2}$
17. $\frac{2}{3} \times 120$ 80
18. $\frac{3}{4} \times 200$ 150
19. $\frac{7}{8} \times 120$ 105
20. $\frac{9}{10} \times 145$ $130\frac{1}{2}$
21. $101 \times \frac{3}{2}$ $151\frac{1}{2}$
22. $60 \times \frac{2}{3}$ 40
23. $88 \times \frac{1}{6}$ $14\frac{2}{3}$
24. $30 \times \frac{7}{9}$ $23\frac{1}{3}$
25. $\frac{6}{7} \times 49$ 42
26. $85 \times \frac{4}{5}$ 68
27. $120 \times \frac{3}{4}$ 90
28. $\frac{1}{10} \times 165$ $16\frac{1}{2}$

Solve.

29. The average railway worker's salary is $1\frac{1}{4}$ times greater than it was two years ago. What is the average today, if it was 24 thousand dollars two years ago? $\$30\ 000$
30. There are about 70 000 km of railway track in Canada. About $\frac{1}{5}$ of the track is in Saskatchewan, $\frac{1}{7}$ in Alberta, and $\frac{1}{10}$ in Manitoba. About how many kilometres of track are there in the Prairie Provinces? $31\ 000\ \text{km}$

Missing Numerators

What is the missing numerator in each fraction?

- a. $\frac{\blacksquare}{4} \times 6 = 6$
- b. $\frac{\blacksquare}{4} \times 6 = 12$
- c. $\frac{\blacksquare}{4} \times 6 = 0$
- d. $\frac{\blacksquare}{7} \times 15 = 15$
- e. $\frac{\blacksquare}{7} \times 15 = 30$
- f. $\frac{\blacksquare}{7} \times 15 = 45$
- g. $\frac{\blacksquare}{11} \times 2 = 2$
- h. $\frac{\blacksquare}{11} \times 2 = 4$
- i. $\frac{\blacksquare}{11} \times 2 = 0$

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Assigning the Practice

Minimum: 1-20, 29

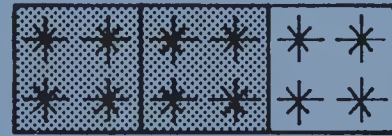
Average: 5-30

Enriched: 5-30

Reinforcement

1. Show the students the following two diagrams that illustrate the multiplication of a fraction and a whole number.

a. $\frac{2}{3} \times 12 = 8$



b. $12 \times \frac{2}{3} = 8$



Twelve jumps of $\frac{2}{3} = 8$.

Ask the students to sketch similar diagrams to illustrate:

$\frac{2}{3} \times 9 = 9 \times \frac{2}{3}$, $\frac{3}{4} \times 8 = 8 \times \frac{3}{4}$,

$\frac{1}{2} \times 12 = 12 \times \frac{1}{2}$.

2. Have the students fill in the correct comparison sign to complete these statements.

a. $\frac{2}{3} \times 12 \bullet 12 \times \frac{3}{4}$

b. $\frac{2}{5} \times 15 \bullet 10 \times \frac{3}{5}$

c. $\frac{5}{8} \times 40 \bullet \frac{5}{7} \times \frac{3}{5}$

d. $\frac{4}{9} \times 81 \bullet \frac{3}{8} \times 80$

Enrichment

1. Assign *Missing Numerators* at the bottom of page 171. Students can explain their reasons for using the numerators they selected.

2. Ask the students to multiply the following as a fraction and a whole number and as a decimal and a whole number.

a. two-fifths times 65

b. four-tenths times 6000

c. one-half times 78

d. three-halves times 34

Extra Practice

Worksheet A39

Pages 170-171

Multiply. Write the answer in simplest terms.

1. $\frac{1}{5}$ of 92 = $18\frac{2}{5}$
2. $\frac{1}{8} \times 47 = 5\frac{7}{8}$
3. $\frac{2}{3}$ of 10 = $6\frac{2}{3}$
4. $\frac{3}{5} \times 15 = 9$
5. $\frac{2}{7} \times 18 = 5\frac{1}{7}$
6. $9 \times \frac{1}{2} = 4\frac{1}{2}$
7. $18 \times \frac{1}{10} = 1\frac{4}{5}$
8. $27 \times \frac{1}{4} = 6\frac{3}{4}$
9. $\frac{2}{3} \times 30 = 20$
10. $\frac{2}{5} \times 45 = 18$
11. $\frac{3}{4} \times 64 = 48$
12. $50 \times \frac{4}{9} = 22\frac{2}{9}$
13. $16 \times \frac{2}{3} = 10\frac{2}{3}$
14. $\frac{5}{6} \times 40 = 33\frac{1}{3}$
15. $\frac{3}{8} \times 21 = 7\frac{7}{8}$

Solve.

6. George is $\frac{7}{8}$ as old as his brother. If his brother is 16, how old is George? 14

UNIT 8 LESSON 2

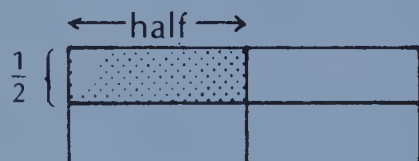
Objective A40

Multiply a fraction by a fraction.

Introducing the Lesson

Write "half of $\frac{1}{2}$ " on the chalkboard.

Ask a student to draw a picture of half of $\frac{1}{2}$ of a candy bar. Let the students conclude that half of $\frac{1}{2}$ is $\frac{1}{4}$.

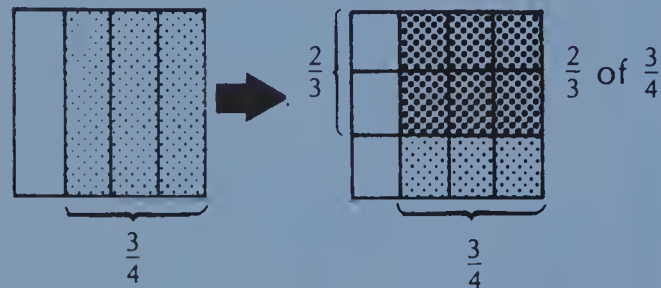


Repeat this activity to show the value of half of $\frac{1}{4}$, half of $\frac{2}{3}$, and half of $\frac{2}{5}$.

Remind the students that "of" used with a fraction is often a signal to multiply. So, half of $\frac{1}{2} = \frac{1}{4}$ can be written $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$; half of $\frac{1}{4}$ can be written $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$; etc.

Teaching the Lesson

Discuss the problem situation given at the top of page 172. Draw the diagram in stages so that the students can more clearly see a picture of $\frac{2}{3}$ of $\frac{3}{4}$.



Note that the rectangle has 12 sections and that 6 of them are shaded with heavy dots. Hence,

$$\frac{2}{3} \text{ of } \frac{3}{4} = \frac{6}{12} \text{ or } \frac{1}{2}.$$

Explain the multiplication arithmetically, also. Stress this procedure.

- Multiply the numerators.
- Multiply the denominators.
- Simplify the fraction if necessary.

Have the students illustrate $\frac{3}{4}$ of $\frac{3}{4}$,

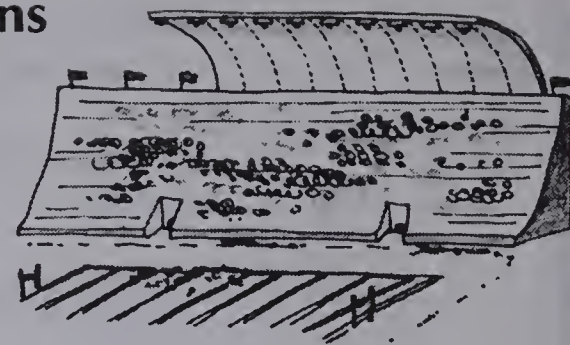
$\frac{2}{5}$ of $\frac{5}{6}$, and $\frac{3}{8}$ of $\frac{2}{3}$ with a rectangular diagram at the chalkboard and then work the multiplications arithmetically.

Multiplying Fractions

Acme Construction was contracted to build a football stadium.

$\frac{3}{4}$ of the seats are to be between the goal lines.

$\frac{2}{3}$ of those seats are to be covered by a roof.



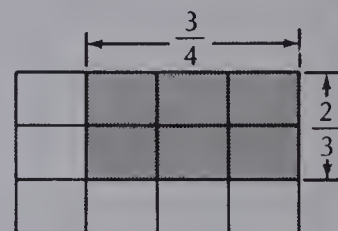
What fraction of all the seats will be covered?

The diagram shows the area covered

by the roof is $\frac{6}{12}$ or $\frac{1}{2}$.

We could find this area by multiplying.

$$\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4} = \frac{6}{12} = \frac{1}{2}$$



EXERCISES

Calculate. Write the answer in simplest terms.

- $\frac{1}{5}$ of $\frac{2}{3} = \frac{1}{5} \times \frac{2}{3} = \frac{2}{15}$
- $\frac{1}{2}$ of $\frac{4}{5} = \frac{1}{2} \times \frac{4}{5} = \frac{2}{5}$
- $\frac{1}{3}$ of $\frac{3}{5} = \frac{1}{3} \times \frac{3}{5} = \frac{1}{5}$
- $\frac{2}{3}$ of $\frac{3}{5} = \frac{2}{3} \times \frac{3}{5} = \frac{2}{5}$
- $\frac{3}{3}$ of $\frac{3}{5} = \frac{3}{3} \times \frac{3}{5} = \frac{3}{5}$
- $\frac{4}{3}$ of $\frac{3}{5} = \frac{4}{3} \times \frac{3}{5} = \frac{4}{5}$
- $\frac{1}{4} \times \frac{5}{6} = \frac{5}{24}$
- $\frac{2}{4} \times \frac{5}{6} = \frac{5}{12}$
- $\frac{3}{4} \times \frac{5}{6} = \frac{5}{8}$
- $\frac{4}{4} \times \frac{5}{6} = \frac{5}{6}$
- $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$
- $\frac{2}{2} \times \frac{3}{4} = \frac{3}{4}$
- $\frac{3}{2} \times \frac{3}{4} = \frac{9}{8}$
- $\frac{4}{2} \times \frac{3}{4} = 1\frac{1}{2}$
- $\frac{1}{5} \times \frac{5}{7} = \frac{1}{7}$
- $\frac{2}{5} \times \frac{5}{7} = \frac{2}{7}$
- $\frac{3}{5} \times \frac{5}{7} = \frac{3}{7}$
- $\frac{4}{5} \times \frac{5}{7} = \frac{4}{7}$
- $\frac{1}{6} \times \frac{4}{8} = \frac{1}{12}$
- $\frac{6}{3} \times \frac{1}{9} = \frac{2}{9}$
- $\frac{5}{4} \times \frac{4}{3} = 1\frac{2}{3}$
- $\frac{1}{12} \times \frac{18}{4} = \frac{3}{8}$

Using the Exercises

- Work through questions 1 to 3 with the students.
- In questions 3 to 18, all the examples in each row have the same pair of denominators. Make sure they are doing the first example in each row correctly before continuing.
- Check the mixed practice in questions 19 to 22 before assigning the *Practice*.

PRACTICE

Multiply. Write the answer in simplest terms.

1. $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$
2. $\frac{2}{5} \times \frac{1}{4} = \frac{1}{10}$
3. $\frac{3}{8} \times \frac{5}{6} = \frac{5}{16}$
4. $\frac{2}{7} \times \frac{3}{11} = \frac{6}{77}$
5. $\frac{3}{7} \times \frac{3}{9} = \frac{1}{7}$
6. $\frac{7}{8} \times \frac{1}{9} = \frac{7}{72}$
7. $\frac{5}{9} \times \frac{9}{10} = \frac{1}{2}$
8. $\frac{1}{6} \times \frac{3}{4} = \frac{1}{8}$
9. $\frac{2}{3} \times \frac{4}{9} = \frac{8}{27}$
10. $\frac{8}{8} \times \frac{10}{11} = \frac{10}{11}$
11. $\frac{3}{8} \times \frac{6}{9} = \frac{1}{4}$
12. $\frac{5}{12} \times \frac{10}{10} = \frac{5}{12}$
13. $\frac{6}{6} \times \frac{5}{9} = \frac{5}{9}$
14. $\frac{3}{4} \times \frac{5}{5} = \frac{3}{4}$
15. $\frac{1}{2} \times \frac{4}{3} = \frac{2}{3}$
16. $\frac{3}{2} \times \frac{5}{8} = \frac{15}{16}$
17. $\frac{3}{8} \times \frac{6}{5} = \frac{9}{20}$
18. $\frac{6}{7} \times \frac{3}{4} = \frac{9}{14}$
19. $\frac{5}{4} \times \frac{8}{15} = \frac{2}{3}$
20. $\frac{10}{7} \times \frac{5}{7} = 1\frac{1}{49}$

What part of an hour is:

21. $\frac{1}{2}$ of $\frac{1}{2}$ hour? $\frac{1}{4}$
22. $\frac{1}{3}$ of $\frac{1}{2}$ hour? $\frac{1}{6}$
23. $\frac{3}{4}$ of $\frac{1}{3}$ hour? $\frac{1}{4}$
24. $\frac{5}{8}$ of $\frac{2}{3}$ hour? $\frac{5}{12}$
25. $\frac{5}{6}$ of 9 hours? $7\frac{1}{2}$
26. $\frac{1}{9}$ of $\frac{3}{4}$ hour? $\frac{1}{12}$

27. How many minutes are there in each of Questions 21 to 26?
15, 10, 15, 25, 450, 5

Telephone Rates

The telephone company gives discounts for calls made outside of "peak" hours.

What are the peak hours?

Calculate the total phone bill.

Monday to Friday	08:00 to 18:00	No discount
Monday to Friday	18:00 to 23:00	$\frac{1}{3}$ Off
Saturday	08:00 to 12:00	No Discount
Saturday	12:00 to 23:00	$\frac{2}{3}$ Off
Sunday	08:00 to 18:00	$\frac{2}{3}$ Off
Sunday	18:00 to 23:00	$\frac{1}{2}$ Off
Daily	23:00 to 08:00	$\frac{1}{3}$ Off

Call	Day	Time	Regular Charge	Discount	Net Charge
Lethbridge	Sunday	19:00	\$16.00	\$8.00	\$8.00
Winnipeg	Wednesday	18:30	\$21.00	\$7.00	\$14.00
Moncton	Saturday	11:30	\$ 4.80	0	\$4.80
Sherbrooke	Friday	07:45	\$27.00	\$18.00	\$9.00
Total					\$35.80

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Assigning the Practice

Minimum: 1-20

Average: 5-26

Enriched: 5-20, 27

Reinforcement

1. Assign *Telephone Rates* at the bottom of page 173.
2. Complete the following cross-number puzzles. All products must be in simplest terms.

a. $\times \rightarrow$

$\frac{2}{3}$	$\frac{2}{5}$	
$\frac{1}{3}$	$\frac{1}{4}$	

b. $\times \rightarrow$

$\frac{3}{4}$	$\frac{1}{5}$	
$\frac{2}{5}$	$\frac{2}{3}$	

c. $\times \rightarrow$

$\frac{1}{2}$	$\frac{3}{4}$	
$\frac{2}{5}$	$\frac{7}{4}$	

d. $\times \rightarrow$

$\frac{2}{5}$	$\frac{1}{10}$	
$\frac{2}{3}$	$\frac{3}{10}$	

e. $\times \rightarrow$

$\frac{3}{4}$	$\frac{2}{5}$	
$\frac{3}{5}$	$\frac{2}{10}$	

f. $\times \rightarrow$

$\frac{2}{5}$	$\frac{3}{5}$	
$\frac{4}{5}$	$\frac{1}{5}$	

Enrichment

1. Fill in the missing numbers in the following multiplications.

- a. $\frac{2}{3} \times \frac{\square}{\square} = \frac{6}{12}$
- b. $\frac{3}{4} \times \frac{\square}{\square} = \frac{3}{8}$
- c. $\frac{2}{5} \times \frac{\square}{\square} = \frac{6}{40}$
- d. $\frac{\square}{\square} \times \frac{3}{5} = \frac{12}{45}$
- e. $\frac{\square}{\square} \times \frac{5}{8} = \frac{30}{48}$
- f. $\frac{\square}{\square} \times \frac{1}{8} = \frac{12}{160}$
- g. $\frac{\square}{5} \times \frac{3}{\square} = \frac{12}{20}$
- h. $\frac{4}{\square} \times \frac{\square}{3} = \frac{8}{27}$

2. Write the multiplication represented in the diagram.

a.

b.

Extra Practice

Multiply. Write the answer in simplest terms.

1. $\frac{1}{4} \times \frac{2}{3} = \frac{1}{6}$
2. $\frac{3}{8} \times \frac{4}{6} = \frac{1}{4}$
3. $\frac{1}{2} \times \frac{1}{5} = \frac{1}{10}$
4. $\frac{2}{3} \times \frac{7}{8} = \frac{7}{12}$
5. $\frac{3}{4} \times \frac{5}{6} = \frac{5}{8}$
6. $\frac{5}{8} \times \frac{1}{2} = \frac{5}{16}$
7. $\frac{1}{3} \times \frac{4}{5} = \frac{4}{15}$
8. $\frac{7}{8} \times \frac{2}{3} = \frac{7}{12}$
9. $\frac{9}{10} \times \frac{1}{3} = \frac{3}{10}$
10. $\frac{7}{10} \times \frac{1}{2} = \frac{7}{20}$
11. $\frac{8}{9} \times \frac{3}{4} = \frac{2}{3}$
12. $\frac{1}{3} \times \frac{7}{8} = \frac{7}{24}$
13. $\frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$
14. $\frac{7}{9} \times \frac{3}{5} = \frac{7}{15}$
15. $\frac{3}{8} \times \frac{5}{6} = \frac{5}{16}$

Solve.

16. Three fifths of the students have blond hair and three fourths of these have blue eyes. What fraction of the students are blue-eyed blonds?
 $\frac{9}{20}$

Worksheet A40

Pages 172-173

UNIT 8 LESSON 3

Objective A41

Multiply a mixed numeral by a fraction or a whole number.

Introducing the Lesson

Review writing mixed numerals as fractions, first with illustrations, and then arithmetically.

$$1\frac{3}{5} = \frac{8}{5} \quad \frac{8}{5} = \frac{8}{5}$$

$$1\frac{3}{5} = \frac{5 \times 1 + 3}{5} = \frac{8}{5}$$

As the students practise several examples, remind them that the denominators are the same in either form.

Teaching the Lesson

Discuss the first problem at the top of page 174. Point out that the prices of stocks are listed as mixed numerals.

Hence, $3\frac{3}{4}$ means $3\frac{3}{4}$ dollars for one share. Illustrate the multiplication and have the students find the product after studying the picture.

$$9 \times 3\frac{3}{4} = 33\frac{3}{4}$$

Then discuss how the multiplication is done arithmetically. Show, also, how the problem can be solved using decimals: $9 \times \$3.75 = \33.75 .

Discuss the second problem at the top of page 174. Explain that the rise and fall of stocks are reported in fractions.

Ask, "How much money is $3\frac{3}{8}$ dollars?"

\$3.375 or \$3.38. Have the students estimate the value of this stock if it is now $\frac{2}{3}$ of its original value. "Is it now more than half of its value?" "What fraction of its original value did it lose?" *It lost $\frac{1}{3}$ of its value.*

Work the multiplication arithmetically at the chalkboard. Point out that the answer is best understood in simplest terms. Ask, "How much money is $2\frac{1}{4}$ dollars?" \$2.25.

Multiplying With Mixed Numerals

Fractions are often used to describe stock market values in dollars.

What is the cost of 9 shares of stock if one share is listed at $3\frac{3}{4}$?

$$9 \times 3\frac{3}{4} = 9 \times \frac{15}{4} = \frac{9 \times 15}{4} = \frac{135}{4} = 33\frac{3}{4}$$

The stock costs $33\frac{3}{4}$ dollars or \$33.75.

On May 1, one share of a stock was listed at $3\frac{3}{8}$.

By July 31, the value of one share dropped to $\frac{2}{3}$ of this amount. What is the new value?

$$\frac{2}{3} \times 3\frac{3}{8} = \frac{2}{3} \times \frac{27}{8} = \frac{2 \times 27}{3 \times 8} = \frac{54}{24} = 2\frac{6}{24} = 2\frac{1}{4}$$

The new value is $2\frac{1}{4}$.

EXERCISES

Multiply. Write the answer in simplest terms.

1. $7 \times 5\frac{1}{2} = 7 \times \frac{11}{2} = 38\frac{1}{2}$
2. $3\frac{2}{5} \times 2 = \frac{17}{5} \times 2 = 6\frac{4}{5}$
3. $\frac{2}{3} \times 1\frac{1}{4} = \frac{2}{3} \times \frac{5}{4} = \frac{5}{6}$
4. $1\frac{3}{8} \times \frac{3}{4} = \frac{11}{8} \times \frac{3}{4} = 1\frac{33}{32}$
5. $3 \times 1\frac{1}{2} = 4\frac{1}{2}$
6. $2 \times 1\frac{1}{2} = 3$
7. $\frac{2}{2} \times 1\frac{1}{2} = 1\frac{1}{2}$
8. $\frac{1}{2} \times 1\frac{1}{2} = \frac{3}{4}$
9. $3 \times 1\frac{1}{3} = 4$
10. $2 \times 1\frac{1}{3} = 2\frac{2}{3}$
11. $\frac{2}{2} \times 1\frac{1}{3} = 1\frac{1}{3}$
12. $\frac{1}{2} \times 1\frac{1}{3} = \frac{2}{3}$
13. $4 \times 2\frac{3}{4} = 11$
14. $2 \times 2\frac{3}{4} = 5\frac{1}{2}$
15. $\frac{2}{2} \times 2\frac{3}{4} = 2\frac{3}{4}$
16. $\frac{1}{4} \times 2\frac{3}{4} = \frac{11}{16}$
17. $8 \times 2\frac{2}{9} = 17\frac{7}{9}$
18. $4 \times 2\frac{2}{9} = 8\frac{8}{9}$
19. $\frac{4}{4} \times 2\frac{2}{9} = 2\frac{2}{9}$
20. $\frac{1}{4} \times 2\frac{2}{9} = \frac{5}{9}$
21. $2\frac{2}{3} \times 6 = 16$
22. $10 \times 4\frac{1}{2} = 45$
23. $9\frac{1}{3} \times \frac{1}{2} = 4\frac{2}{3}$
24. $\frac{5}{6} \times 3\frac{4}{5} = 3\frac{1}{6}$
25. $\frac{5}{6} \times 3\frac{1}{3} = 2\frac{7}{6}$
26. $\frac{7}{12} \times 4 = 2\frac{1}{3}$
27. $4\frac{5}{7} \times \frac{2}{3} = 3\frac{1}{7}$
28. $\frac{4}{9} \times 6\frac{1}{3} = 2\frac{22}{27}$

Using the Exercises

- Questions 1 to 4 remind the students that they should change the mixed numeral to a fraction before multiplying. This is indicated by the boxed mixed numerals.
- Questions 5 to 20 use a pattern approach to help students arrive at reasonable answers.
- Questions 21 to 28 require the students to find products without any aids.

PRACTICE

Multiply. Write the answer in simplest terms.

1. $\frac{1}{2} \times 9\frac{3}{4} = 4\frac{3}{4}$
2. $3\frac{1}{7} \times 3 = 9\frac{3}{7}$
3. $\frac{3}{3} \times 5\frac{5}{6} = 5\frac{5}{6}$
4. $\frac{2}{3} \times 1\frac{1}{2} = 1$
5. $3 \times 5\frac{3}{5} = 16\frac{4}{5}$
6. $3\frac{1}{4} \times 4 = 13$
7. $6\frac{2}{3} \times \frac{1}{4} = 1\frac{2}{3}$
8. $\frac{3}{8} \times 2\frac{1}{4} = \frac{27}{32}$
9. $4\frac{5}{8} \times 2 = 9\frac{1}{4}$
10. $6 \times 7\frac{1}{5} = 43\frac{1}{5}$
11. $\frac{1}{3} \times 4\frac{6}{7} = 1\frac{13}{21}$
12. $3\frac{2}{3} \times \frac{1}{4} = \frac{11}{12}$
13. $6\frac{2}{3} \times \frac{3}{4} = 5$
14. $7\frac{5}{8} \times 4 = 30\frac{1}{2}$
15. $\frac{5}{9} \times 3\frac{1}{5} = 1\frac{7}{9}$
16. $\frac{8}{11} \times 2\frac{1}{2} = 1\frac{9}{11}$
17. $18 \times 1\frac{1}{3} = 24$
18. $\frac{3}{7} \times 2\frac{1}{10} = \frac{9}{10}$
19. $2\frac{1}{11} \times 10 = 20\frac{10}{11}$
20. $\frac{7}{8} \times 5\frac{1}{3} = 4\frac{2}{3}$

21. Copy and complete the chart.

Value of One Share of Stock	Value of 4 Shares	Value of 8 Shares	Value of 15 Shares	Value of 50 Shares
$2\frac{1}{2}$	10	20	$37\frac{1}{2}$	125
$6\frac{1}{4}$	25	50	$93\frac{3}{4}$	$312\frac{1}{2}$
$7\frac{1}{8}$	$28\frac{1}{2}$	57	$106\frac{7}{8}$	$356\frac{1}{4}$
$2\frac{3}{8}$	$9\frac{1}{2}$	19	$35\frac{5}{8}$	$118\frac{3}{4}$

More Mixed Numerals

To do multiplication involving two mixed numerals, change both to the form of fractions.

$$2\frac{1}{2} \times 3\frac{1}{2} = \frac{5}{2} \times \frac{7}{2} = \frac{35}{4} = 8\frac{3}{4}$$

Multiply. Write the answer in simplest terms.

1. $3\frac{2}{3} \times 1\frac{1}{2} = 5\frac{1}{2}$
2. $2\frac{1}{5} \times 1\frac{1}{3} = 2\frac{14}{15}$
3. $1\frac{1}{3} \times 2\frac{1}{4} = 3$
4. $3\frac{3}{4} \times 1\frac{1}{2} = 5\frac{5}{8}$
5. $1\frac{3}{5} \times 3\frac{1}{2} = 5\frac{3}{5}$
6. $2\frac{3}{4} \times 1\frac{1}{6} = 3\frac{5}{24}$
7. $2\frac{1}{3} \times 1\frac{4}{5} = 4\frac{1}{5}$
8. $3\frac{1}{8} \times 2\frac{4}{5} = 8\frac{3}{4}$
9. $1\frac{3}{10} \times 2\frac{1}{2} = 3\frac{1}{4}$
10. $2\frac{2}{5} \times 1\frac{3}{8} = 3\frac{3}{10}$
11. $1\frac{1}{3} \times 2\frac{1}{4} = 3$
12. $1\frac{5}{9} \times 2\frac{1}{7} = 3\frac{1}{3}$

175

Assigning the Practice

Minimum: 1-20

Average: 13-21

Enriched: 13-21

Reinforcement

1. Discuss the method for multiplying two mixed numerals given at the bottom of page 175 in *More Mixed Numerals*. Assign the problems.

2. Multiply the following as fractions and then as decimals.

a. $1\frac{1}{2} \times \frac{1}{10}$

b. $3\frac{3}{4} \times \frac{1}{2}$

c. $9\frac{1}{5} \times \frac{4}{5}$

d. $6\frac{1}{2} \times \frac{1}{4}$

Enrichment

1. Solve these multiplications involving three factors.

a. $\frac{3}{8} \times \frac{5}{6} \times 2$

b. $\frac{1}{3} \times \frac{7}{9} \times 12$

c. $\frac{1}{4} \times 3\frac{1}{3} \times 6$

d. $7 \times 5\frac{1}{2} \times \frac{1}{3}$

e. $6\frac{1}{2} \times \frac{2}{3} \times \frac{1}{4}$

f. $1\frac{1}{2} \times 1\frac{1}{3} \times 2$

2. Write the following kinds of multiplications on cards. Pass them out to the students to solve and then exchange them for more.

$3 \times \text{stock icon} = \frac{15}{2}$

$2 \times \text{stock icon} = \frac{20}{3}$

$3\frac{1}{4} \times \text{stock icon} = \frac{52}{12}$

$2\frac{1}{2} \times \text{stock icon} = \frac{25}{4}$

3. Have the students pick out a stock and graph its value for a one- or two-week period.

Extra Practice

Multiply. Write the answer in simplest terms.

1. $\frac{1}{4} \times 6\frac{1}{2} = 1\frac{5}{8}$
2. $\frac{1}{3} \times 2\frac{3}{4} = \frac{11}{12}$
3. $\frac{1}{2} \times 3\frac{1}{3} = 1\frac{2}{3}$
4. $\frac{3}{4} \times 8\frac{1}{4} = 6\frac{3}{16}$
5. $\frac{2}{5} \times 3\frac{1}{5} = 1\frac{7}{25}$
6. $\frac{2}{3} \times 4\frac{1}{2} = 3$
7. $3\frac{2}{3} \times \frac{9}{10} = 3\frac{3}{10}$
8. $2\frac{3}{8} \times \frac{2}{3} = 1\frac{7}{12}$
9. $4\frac{2}{3} \times \frac{6}{7} = 4$
10. $\frac{3}{8} \times 1\frac{2}{5} = \frac{21}{40}$
11. $\frac{2}{9} \times 2\frac{1}{4} = \frac{1}{2}$
12. $\frac{3}{7} \times 3\frac{5}{6} = 1\frac{9}{14}$
13. $2\frac{3}{5} \times \frac{2}{3} = 1\frac{11}{15}$
14. $3\frac{5}{6} \times \frac{3}{4} = 2\frac{7}{8}$
15. $1\frac{1}{2} \times \frac{7}{8} = 1\frac{5}{16}$

Solve.

6. Merle resolved that she would spend half of her free time doing useful things. On Saturday she has $5\frac{1}{2}$ hours free. How much of that time should she spend on useful things? $2\frac{3}{4} \text{ h}$

Worksheet A41

Pages 174-175

Objective PS7

Use formulas to find the measurements of geometric figures.

Introducing the Lesson

Review the parts of a circle learned in Unit 5, Lesson 5, page 106. Draw several circles on centimetre grid paper on an overhead projector. Draw a diameter for each. Have the students identify the length of the radius and diameter for each. Review the relationship between the diameter and the circumference (the circumference is about 3 times as long as the diameter). Show this relationship with a string. Remind the students that the circumference is 3.14 (or **pi**) times longer than the diameter.

Show the students that **pi** can be represented either as the decimal 3.14 or as the equivalent fraction $\frac{22}{7}$.

Teaching the Lesson

Ask the students to name previously learned formulas which have been used in measuring geometric figures. Emphasize how the work should be recorded: 1. write the formula, 2. substitute known measurements, 3. calculate, 4. label the result.

Talk about how a formula is a plan of action or a set of directions. It tells you what to do.

Point out the formulas on pages 176 and 177. Explain how the formulas for measuring a circle can include **pi** as either 3.14 or $\frac{22}{7}$, whichever is more

convenient. Recall how multiplying by $\frac{1}{2}$ is the same as dividing by 2.

($\frac{1}{2} \times 8 = 4$ or $\frac{8}{2} = 4$) Hence the formula for finding the area of a triangle can be written either of two ways: $A = \frac{B \times H}{2}$ or $A = \frac{1}{2} \times B \times H$. Note the formula for

finding the volume of a sphere. Review how to raise numbers to the third power.

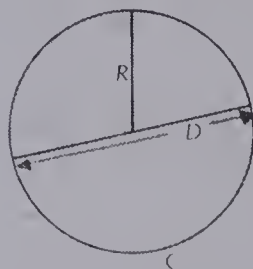
Formulas

A special number called **pi** was discussed on page 106.

Pi is often approximated by a fraction.

Pi is about $\frac{22}{7}$.

Pi is used in calculations involving circles.



C = Circumference

R = Radius

D = Diameter

A = Area

Using letters for measurements of parts of a circle, we can write **formulas** for area and circumference.

$$A = \text{pi} \times R^2$$

$$C = \text{pi} \times D$$

EXERCISES

- What is the circumference of a circle with a diameter of 7 cm?
 $7 \times \text{pi}$ (about 22 cm)
- What is the area of a circle with a radius of 7 cm?
 $49 \times \text{pi}$ (about 54 cm²)
- What is the circumference of a circle with a radius of 3.5 cm?
 $7 \times \text{pi}$ (about 22 cm)
- What is the area of a circle with a diameter of 14 cm?
 $49 \times \text{pi}$ (about 147 cm²)
- Write a formula that shows the radius in terms of the diameter.
 $R = D \div 2$
- Write a formula that shows the diameter in terms of the radius.
 $D = 2 \times R$

176

Using the Exercises

- Questions 1 to 4 require the students to use formulas to calculate the circumference and area of circles. For questions 3 and 4, students must know that $2 \times R = D$. See that the students record the formula, substitute, calculate, and label properly for each question.

$$C = \text{pi} \times D$$

$$C = \frac{22}{7} \times 7$$

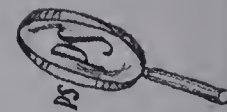
$$C = 22 \text{ cm}$$

$$A = \text{pi} \times R^2$$

$$A = \frac{22}{7} \times 7 \times 7$$

$$A = 154 \text{ cm}^2$$

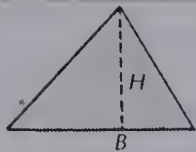
- Questions 5 and 6 require the students to generate a formula that states the relationship between diameter and radius.



PRACTICE

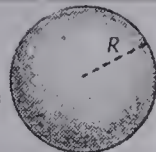
Area of a Triangle

$$A = \frac{1}{2} \times B \times H$$



Volume of a Sphere

$$V = \frac{4}{3} \times \pi \times R^3$$



Solve these problems using the formulas above.

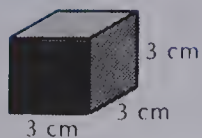
1. What is the area of a triangle with a base of 4 cm and a height of 3 cm? **6 cm²**

2. What is the volume of a sphere with a radius of 1 cm? **$\frac{4}{3} \times \pi \text{ cm}^3$ (about 4 cm³)**

3. What is the area of a triangle with a base of 5 cm and a height of 4 cm? **10 cm²**

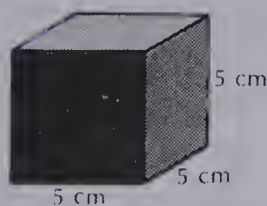
4. Which has a greater volume, the box or the sphere?

Sphere



5. Which has a greater volume, the box or the sphere?

Box



REVIEW

Multiply. Write the answer in simplest terms.

A39 1. $\frac{1}{5} \times 8$ **$1\frac{3}{5}$** 2. $\frac{11}{12} \times 8$ **$7\frac{1}{3}$** 3. $\frac{5}{7} \times 6$ **$4\frac{2}{7}$** 4. $40 \times \frac{5}{6}$ **$33\frac{1}{3}$**

A40 5. $\frac{1}{2} \times \frac{6}{7}$ **$\frac{3}{7}$** 6. $\frac{3}{5} \times \frac{8}{9}$ **$\frac{8}{15}$** 7. $\frac{2}{3} \times \frac{5}{7}$ **$\frac{10}{21}$** 8. $\frac{9}{10} \times \frac{4}{5}$ **$\frac{18}{25}$**

A41 9. $18 \times 1\frac{1}{3}$ **24** 10. $6\frac{1}{4} \times 10$ **$62\frac{1}{2}$** 11. $\frac{2}{3} \times 5\frac{1}{2}$ **$3\frac{2}{3}$** 12. $3\frac{3}{7} \times \frac{1}{2}$ **$1\frac{5}{7}$**

177

Assigning the Practice

Minimum: 1-3

Average: 1-5

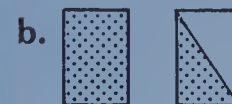
Enriched: 1-5

Review Exercises

Questions	Objective	Pages
1-4	A39	170-171
5-8	A40	172-173
9-12	A41	174-175

Reinforcement

1. Give the students a sheet of rectangles with dimensions in even centimetres. The rectangles should be in pairs. Students measure and use the proper formula to calculate area of the rectangle and the triangle in each pair. See if a pattern is noticed.

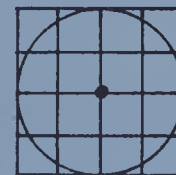


2. Give the students a sheet of circles drawn on centimetre grid paper. Have them calculate the circumference and area for each using the appropriate formulas.

$$C = \pi \times D$$

$$C = \frac{22}{7} \times 4$$

$$C = 12\frac{4}{7} \text{ cm}$$



$$A = \pi \times R^2$$

$$A = \frac{22}{7} \times 2 \times 2$$

$$A = 12\frac{4}{7} \text{ cm}^2$$

Enrichment

After experimenting with several measurements, have the students make these judgments.

1. Compare the length, perimeter, and area of several squares. If the length is doubled, what happens to the perimeter and area? If the length is increased three times, what happens to the perimeter and area?

2. Compare the radius, circumference, and area of several circles. If the radius is doubled, what happens to the circumference and area? If the radius is increased three times, what happens to the circumference and area?

Extra Practice

Worksheet PS7

Pages 176-177

Use these formulas to solve the problems.

Circle:

$$D = 2 \times R$$

$$C = \pi \times D$$

$$A = \pi \times R^2$$

Rectangle: $A = L \times W$

Rectangular Prism: $V = L \times W \times H$

Triangle: $A = \frac{1}{2} \times B \times H$ or $\frac{B \times H}{2}$

Solve these problems using the formulas.

1. What is the area of a triangle that has a base of 10 cm and a height of 8 cm? **40 cm²**

2. What is the diameter of a circle having a radius of 2.4 m? **4.8 m**

3. What is the volume of a box that is 11 cm long, 8 cm wide, and 3.5 cm high? **308 cm³**

4. A circular table top has a radius of 40 cm. What is its area? **$1600 \times \pi$ (about 4800 cm²)**

5. What is the area of a rectangle 6.2 m wide and 8.5 m long? **52.7 m²**

Objective A42

Multiply a decimal greater than 1 by a whole number.

Introducing the Lesson

Write 6.34, 57.9, and 2.836 on the chalkboard. Review the value and names of the decimal places as the students write the numbers in expanded form.

$$6 + 0.3 + 0.04 = 6.34$$

Point out that 57.9 has one decimal place, 6.34 has two decimal places, and 2.836 has three decimal places.

Teaching the Lesson

Look at the three area problems at the top of page 178. Explain how the areas are calculated using the formula. Point out that the number of decimal places in both factors is the same as the number of decimal places in the product.

$$\begin{aligned} A &= L \times W & 3.92 & \left\{ \begin{array}{l} 2 \text{ decimal places} \\ 0 \text{ decimal places} \end{array} \right. \\ A &= 8 \times 3.92 & \times 8 & \\ A &= 31.36 \text{ km}^2 & 31.36 & \left\{ \begin{array}{l} 2 \text{ decimal places} \end{array} \right. \end{aligned}$$

Show how the reasonableness of the product (or the position of the decimal point) can be checked by rounding the factors to the nearest whole number. Explain that the estimations of the first two products required a factor to be *rounded up* to the nearest whole number. Hence, the estimated products are slightly *more than* the actual products. The opposite is true for the last estimation.

Show also how the positions of the decimal points in the products can be verified through repeated addition.

Give the students a sheet of rectangles similar to those at the top of page 178. Have them calculate the exact areas using the formula and then check the reasonableness of their answers by estimating.

Multiplying Decimals

Find the area of each rectangular lot.

$\begin{array}{r} 9.6 \text{ km}^2 \\ \times 2 \\ \hline 19.2 \text{ km}^2 \end{array}$ <p>4.8 km 2 km</p>	$\begin{array}{r} 31.36 \text{ km}^2 \\ \times 8 \\ \hline 250.88 \text{ km}^2 \end{array}$ <p>3.92 km 8 km</p>	$\begin{array}{r} 7.105 \text{ km}^2 \\ \times 7 \\ \hline 49.735 \text{ km}^2 \end{array}$ <p>1.015 km 7 km</p>
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Always estimate to check whether a product is reasonable.

$$\begin{array}{r} 5 \\ \times 2 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 4 \\ \times 8 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 1 \\ \times 7 \\ \hline 7 \end{array}$$

EXERCISES

How many decimal places will be in each answer? Multiply.

1. $\begin{array}{r} 32 \\ \times 4 \\ \hline 128 \end{array}$	2. $\begin{array}{r} 3.2 \\ \times 4 \\ \hline 12.8 \end{array}$	3. $\begin{array}{r} 3.02 \\ \times 4 \\ \hline 12.08 \end{array}$	4. $\begin{array}{r} 3.002 \\ \times 4 \\ \hline 12.008 \end{array}$	5. $\begin{array}{r} 3.222 \\ \times 4 \\ \hline 12.888 \end{array}$
6. $\begin{array}{r} 63 \\ \times 3 \\ \hline 189 \end{array}$	7. $\begin{array}{r} 6.3 \\ \times 3 \\ \hline 18.9 \end{array}$	8. $\begin{array}{r} 6.03 \\ \times 3 \\ \hline 18.09 \end{array}$	9. $\begin{array}{r} 6.003 \\ \times 3 \\ \hline 18.009 \end{array}$	10. $\begin{array}{r} 6.333 \\ \times 3 \\ \hline 18.999 \end{array}$
11. $\begin{array}{r} 57 \\ \times 9 \\ \hline 513 \end{array}$	12. $\begin{array}{r} 5.7 \\ \times 9 \\ \hline 51.3 \end{array}$	13. $\begin{array}{r} 5.07 \\ \times 9 \\ \hline 45.63 \end{array}$	14. $\begin{array}{r} 5.007 \\ \times 9 \\ \hline 45.063 \end{array}$	15. $\begin{array}{r} 5.777 \\ \times 9 \\ \hline 51.993 \end{array}$

Estimate the answer, then multiply.

16. $\begin{array}{r} 7.8 \\ \times 7 \\ \hline 54.6 \end{array}$	17. $\begin{array}{r} 8.13 \\ \times 9 \\ \hline 73.17 \end{array}$	18. $\begin{array}{r} 6.002 \\ \times 4 \\ \hline 24.008 \end{array}$	19. $\begin{array}{r} 4.217 \\ \times 48 \\ \hline 202.416 \end{array}$	20. $\begin{array}{r} 8.04 \\ \times 19 \\ \hline 152.76 \end{array}$
21. $\begin{array}{r} 4.23 \\ \times 14 \\ \hline 59.22 \end{array}$	22. $\begin{array}{r} 8.014 \\ \times 27 \\ \hline 216.378 \end{array}$	23. $\begin{array}{r} 5.44 \\ \times 35 \\ \hline 190.40 \end{array}$	24. $\begin{array}{r} 6.72 \\ \times 17 \\ \hline 114.24 \end{array}$	25. $\begin{array}{r} 9.32 \\ \times 47 \\ \hline 438.04 \end{array}$

Using the Exercises

- The multiplications in questions 1 to 15 are related and reflect changes in the decimal point position. Once the students have done them, write them on the chalkboard and compare the products.
- Questions 16 to 25 use a variety of numbers of decimal places in the factors. As the students calculate, they must be careful to position the decimal point correctly. Encourage estimation to check the reasonableness of answers.

PRACTICE

Find the product.

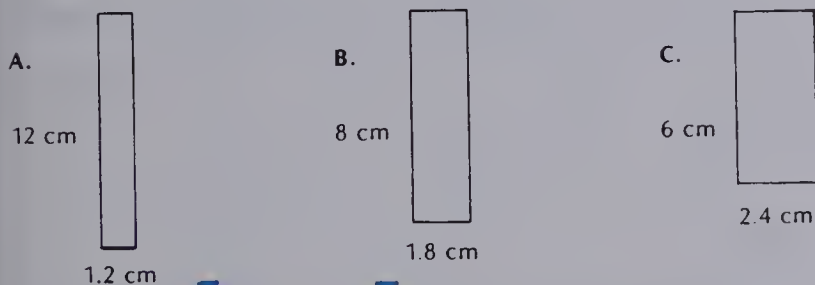
- | | | | | |
|---|--|---|---|--|
| 1. $\begin{array}{r} 5.8 \\ \times 6 \\ \hline 34.8 \end{array}$ | 2. $\begin{array}{r} 3.45 \\ \times 7 \\ \hline 24.15 \end{array}$ | 3. $\begin{array}{r} 6.003 \\ \times 4 \\ \hline 24.012 \end{array}$ | 4. $\begin{array}{r} 9.02 \\ \times 8 \\ \hline 72.16 \end{array}$ | 5. $\begin{array}{r} 4.3 \\ \times 7 \\ \hline 30.1 \end{array}$ |
| 6. $\begin{array}{r} 7.559 \\ \times 8 \\ \hline 60.472 \end{array}$ | 7. $\begin{array}{r} 2.07 \\ \times 6 \\ \hline 12.42 \end{array}$ | 8. $\begin{array}{r} 3.017 \\ \times 9 \\ \hline 27.153 \end{array}$ | 9. $\begin{array}{r} 7.6 \\ \times 5 \\ \hline 38.0 \end{array}$ | 10. $\begin{array}{r} 4.86 \\ \times 7 \\ \hline 34.02 \end{array}$ |
| 11. $\begin{array}{r} 3.7 \\ \times 61 \\ \hline 225.7 \end{array}$ | 12. $\begin{array}{r} 5.03 \\ \times 22 \\ \hline 110.66 \end{array}$ | 13. $\begin{array}{r} 7.006 \\ \times 38 \\ \hline 266.228 \end{array}$ | 14. $\begin{array}{r} 1.41 \\ \times 15 \\ \hline 21.15 \end{array}$ | 15. $\begin{array}{r} 6.012 \\ \times 14 \\ \hline 84.168 \end{array}$ |
| 16. $\begin{array}{r} 9.71 \\ \times 85 \\ \hline 825.35 \end{array}$ | 17. $\begin{array}{r} 6.075 \\ \times 74 \\ \hline 449.55 \end{array}$ | 18. $\begin{array}{r} 4.215 \\ \times 501 \\ \hline 2111.715 \end{array}$ | 19. $\begin{array}{r} 9.008 \\ \times 243 \\ \hline 2188.944 \end{array}$ | 20. $\begin{array}{r} 3.172 \\ \times 132 \\ \hline 418.704 \end{array}$ |

The length and width of each rectangle are given. Calculate the area. Estimate to check whether each answer is reasonable.

- | | |
|--|--|
| 21. length = 17.2 m
width = 8 m 137.6 m^2 | 22. length = 12 m
width = 6.08 m 72.96 m^2 |
| 23. length = 5.064 km
width = 13 km 65.832 km^2 | 24. length = 72 km
width = 74.25 km 5346 km^2 |

Areas and Perimeters

Compare the areas and perimeters of rectangles A, B, and C. Replace each \blacksquare with $<$, $=$, or $>$.



1. Area of A \blacksquare Area of B \blacksquare Area of C
 2. Perimeter of A \blacksquare Perimeter of B \blacksquare Perimeter of C
- $>$ $>$

179

Assigning the Practice

Minimum: 1-15, 21-22

Average: 6-24

Enriched: 6-24

Reinforcement

1. Assign *Areas and Perimeters* at the bottom of page 179.

2. Divide the students into two teams. Give each team the same multiplication question. Have one team calculate the product with paper and pencil and the other team use a calculator. See which team is more accurate. Have the teams take turns using the calculators.

Enrichment

Ask the students to compare the products in each pair of problems.

- | | |
|--------------------------------|------------------|
| a. $4 \times \frac{7}{10}$ | 4×0.7 |
| b. $3 \times \frac{9}{10}$ | 3×0.9 |
| c. $5 \times \frac{15}{100}$ | 5×0.15 |
| d. $6 \times \frac{12}{100}$ | 6×0.12 |
| e. $3 \times 1\frac{7}{10}$ | 3×1.7 |
| f. $5 \times 2\frac{13}{100}$ | 5×2.13 |
| g. $5 \times \frac{12}{1000}$ | 5×0.012 |
| h. $4 \times \frac{123}{1000}$ | 4×0.123 |

Extra Practice


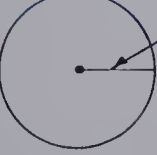

Worksheet A42

Pages 178-179

Multiply. Estimate to check whether the answer is reasonable.

- | | | | |
|---|---|--|--|
| 1. $\begin{array}{r} 2.6 \\ \times 4 \\ \hline 10.4 \end{array}$ | 2. $\begin{array}{r} 8.17 \\ \times 3 \\ \hline 24.51 \end{array}$ | 3. $\begin{array}{r} 7.42 \\ \times 6 \\ \hline 44.52 \end{array}$ | 4. $\begin{array}{r} 3.472 \\ \times 3 \\ \hline 10.416 \end{array}$ |
| 5. $\begin{array}{r} 9.07 \\ \times 5 \\ \hline 45.35 \end{array}$ | 6. $\begin{array}{r} 6.7 \\ \times 3 \\ \hline 20.1 \end{array}$ | 7. $\begin{array}{r} 4.8 \\ \times 6 \\ \hline 28.8 \end{array}$ | 8. $\begin{array}{r} 5.016 \\ \times 2 \\ \hline 10.032 \end{array}$ |
| 9. $\begin{array}{r} 1.192 \\ \times 7 \\ \hline 8.344 \end{array}$ | 10. $\begin{array}{r} 2.34 \\ \times 6 \\ \hline 14.04 \end{array}$ | 11. $\begin{array}{r} 9.5 \\ \times 9 \\ \hline 85.5 \end{array}$ | 12. $\begin{array}{r} 7.81 \\ \times 2 \\ \hline 15.62 \end{array}$ |

Find the diameter of each circle.

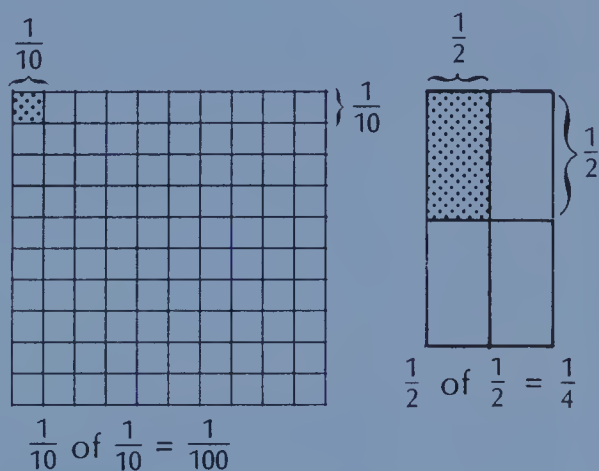
- | | | |
|--|--|---|
| 13.  14.6 cm | 14.  16.230 m | 15.  7.10 mm |
|--|--|---|

Objective A43

Multiply a decimal less than 1 in tenths by a decimal in the same form.

Introducing the Lesson

Show the following diagrams on the chalkboard and ask, "What is a tenth of a tenth? a half of a half?"



Teaching the Lesson

As the students look at the above diagrams ask them to recall that they represent the multiplication of fractions.

$$\frac{1}{10} \times \frac{1}{10} = \frac{1}{100} \quad \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

Ask the students to rename each multiplication in decimals.

$$\begin{array}{r} 0.1 \\ \times 0.1 \\ \hline 0.01 \end{array} \quad \begin{array}{r} 0.5 \\ \times 0.5 \\ \hline 0.25 \end{array}$$

Point out that since there is a total of two decimal places in the factors, there are two decimal places in the product.

Read and discuss the problem at the top of page 180.

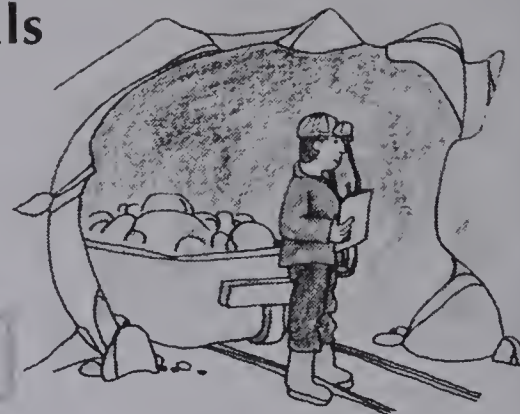
Write the following on the chalkboard to help the students visualize multiplication of decimals. After enough practice, students should see that *tenths* \times *tenths* = *hundredths*.

$$\frac{1}{10} \times \frac{2}{10}, \quad \frac{7}{10} \times \frac{3}{10}, \quad \frac{9}{10} \times \frac{1}{10}$$

Once the above generalization is made, students should not experience difficulty with adding a zero in the tenths place.

Multiplying Decimals

An Ontario mine produces about 0.9 t (tonnes) of silver every week. Five years ago, they produced only half (0.5) as much. About how much silver did they mine five years ago?



$$0.5 \times 0.9 = \blacksquare \quad \frac{5}{10} \times \frac{9}{10} = \frac{45}{100}$$

$$\begin{array}{r} 0.9 \\ \times 0.5 \\ \hline ? \end{array}$$

$$\begin{array}{r} 9 \\ \times 5 \\ \hline 45 \end{array}$$

$$\begin{array}{r} 0.9 \\ \times 0.5 \\ \hline 0.45 \end{array}$$

1 decimal place
1 decimal place
2 decimal places

Five years ago, the mine produced about 0.45 t of silver every week.

tenths \times tenths \rightarrow hundredths

EXERCISES

Multiply.

- $\frac{1}{10} \times \frac{2}{10} = \frac{2}{50}$
- $\frac{3}{10} \times \frac{8}{10} = \frac{24}{100}$
- $\frac{2}{10} \times \frac{4}{10} = \frac{8}{100}$
- $\frac{7}{10} \times \frac{9}{10} = \frac{63}{100}$
- $\begin{array}{r} 0.2 \\ \times 0.1 \\ \hline 0.02 \end{array}$
- $\begin{array}{r} 0.8 \\ \times 0.3 \\ \hline 0.24 \end{array}$
- $\begin{array}{r} 0.4 \\ \times 0.2 \\ \hline 0.08 \end{array}$
- $\begin{array}{r} 0.9 \\ \times 0.7 \\ \hline 0.63 \end{array}$
- $\frac{1}{10} \times \frac{8}{10} = \frac{8}{100}$
- $\frac{7}{10} \times \frac{3}{10} = \frac{21}{100}$
- $\frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$
- $\frac{4}{10} \times \frac{4}{10} = \frac{16}{100}$
- $\begin{array}{r} 0.8 \\ \times 0.1 \\ \hline 0.08 \end{array}$
- $\begin{array}{r} 0.3 \\ \times 0.7 \\ \hline 0.21 \end{array}$
- $\begin{array}{r} 0.1 \\ \times 0.1 \\ \hline 0.01 \end{array}$
- $\begin{array}{r} 0.4 \\ \times 0.4 \\ \hline 0.16 \end{array}$
- $\begin{array}{r} 0.9 \\ \times 0.9 \\ \hline 0.81 \end{array}$
- $\begin{array}{r} 0.7 \\ \times 0.8 \\ \hline 0.56 \end{array}$
- $\begin{array}{r} 0.6 \\ \times 0.1 \\ \hline 0.06 \end{array}$
- $\begin{array}{r} 0.3 \\ \times 0.3 \\ \hline 0.09 \end{array}$

Using the Exercises

- Questions 1 to 16 are written first in fraction form and then in decimal form. Have the students compare the results of each pair of questions.
- Questions 17 to 20 require the student to find the products without any aid.

PRACTICE

Find the product.

1. $0.6 \times 0.3 = 0.18$
2. $0.7 \times 0.7 = 0.49$
3. $0.2 \times 0.3 = 0.06$
4. $0.9 \times 0.3 = 0.27$
5. $0.8 \times 0.6 = 0.48$
6. $0.4 \times 7 = 2.8$
7. $0.5 \times 0.4 = 0.20$
8. $0.3 \times 0.3 = 0.09$
9. $0.7 \times 0.1 = 0.07$
10. $0.3 \times 1 = 0.3$
11. $0.8 \times 0.4 = 0.32$
12. $0.1 \times 9 = 0.9$
13. $0.5 \times 0.3 = 0.15$
14. $0.8 \times 8 = 6.4$
15. $0.9 \times 0.2 = 0.18$

Copy and complete. Use $<$, $=$, or $>$.

16. $0.2 + 0.2 \begin{matrix} > \\ \end{matrix} 0.2 \times 0.2$
17. $0.5 + 0.7 \begin{matrix} = \\ \end{matrix} 3 \times 0.4$
18. $15 - 14.3 \begin{matrix} < \\ \end{matrix} 10 \times 0.7$
19. $0.1 \times 0.1 \begin{matrix} = \\ \end{matrix} 1 - 0.99$
20. $2.5 - 0.7 \begin{matrix} = \\ \end{matrix} 0.6 \times 3$
21. $0.5 \times 0.9 \begin{matrix} > \\ \end{matrix} 0.02 + 0.4$

22. Copy and complete.

\times	0.8	0.9	0.7	0.1	9	36
100	80	90	70	10	900	3600
10	8	9	7	1	90	360
1	0.8	0.9	0.7	0.1	9	36
0.1	0.08	0.09	0.07	0.01	0.9	3.6

23. Newfoundland produces about half (0.5) of Canada's iron ore. Quebec produces about 0.6 as much as Newfoundland. What part of Canada's total does Quebec produce? $\frac{3}{10}$ (0.3)

Combinations

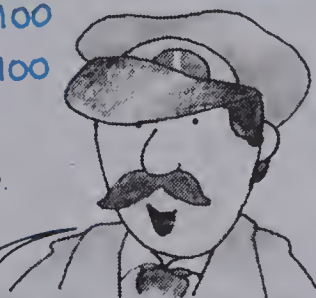
$$5 \times 5 \times 5 = 5 \times 5 = 100$$

$$7 \times 7 + 7 \times 7 + \frac{7}{7} + \frac{7}{7} = 100$$

1. Use six 9s to write an expression for 100.
2. Use five 5s to write an expression for 100.
3. Use eight 7s to write an expression for 100.

Here is one solution:

$$9 \times 9 + 9 + 9 + \frac{9}{9} = 100$$



181

Assigning the Practice

Minimum: 1-15, 22-23

Average: 6-23

Enriched: 6-23

Reinforcement

1. Ask the students to multiply the following as fractions after they have multiplied them as decimals to verify their products.

- a. 0.1×0.3
- b. 0.4×0.3
- c. 0.6×0.2
- d. 0.7×0.3
- e. 0.2×0.3
- f. 0.8×0.5
- g. 0.8×0.4
- h. 0.1×0.2

2. Give the students a 10 by 10 grid on which to illustrate one of the above multiplications.

Enrichment

1. Assign *Combinations* at the bottom of page 181.

2. Write a related multiplication for each division.

- a. $10 \div 10 = 1$ $10 \times 0.1 = 1$
- b. $100 \div 10 = 10$
- c. $80 \div 10 = 8$
- d. $40 \div 10 = 4$
- e. $5 \div 10 = 0.5$

Have the students conclude that dividing by 10 yields the same result as multiplying by 0.1.

Extra Practice

Worksheet A43

Pages 180-181

Find the product.

1. $0.8 \times 0.2 = 0.16$
2. $0.7 \times 0.5 = 0.35$
3. $0.1 \times 0.3 = 0.03$
4. $0.5 \times 0.8 = 0.40$
5. $0.2 \times 0.2 = 0.04$
6. $0.9 \times 0.2 = 0.18$
7. $0.2 \times 0.1 = 0.02$
8. $0.3 \times 0.6 = 0.18$
9. $0.4 \times 0.2 = 0.08$
10. $0.7 \times 0.4 = 0.28$
11. $0.3 \times 0.3 = 0.09$
12. $0.9 \times 0.8 = 0.72$
13. $0.1 \times 0.1 = 0.01$
14. $0.1 \times 0.5 = 0.05$
15. $0.7 \times 0.5 = 0.35$

Complete. Use $<$, $=$, or $>$.

6. $0.4 + 0.4 \begin{matrix} = \\ \end{matrix} 0.4 \times 2$
7. $0.3 + 0.6 \begin{matrix} > \\ \end{matrix} 0.9 \times 0.1$
8. $6 \times 0.7 \begin{matrix} < \\ \end{matrix} 20.5 + 20.5$
9. $0.4 \times 0.7 \begin{matrix} = \\ \end{matrix} 0.36 - 0.08$

Objective A44

Multiply a decimal greater than 1 in tenths by a decimal in the same form.

Introducing the Lesson

Read the problem and study the graph at the top of page 182. Point out the features of the graph so it is clearly interpreted by all. Be sure the students understand that the numbers at the bottom represent thousands of people. Point out that the two vertical black bars represent the 6.9 thousand people 2.2 times.

Teaching the Lesson

Have the students estimate what 2.2 times 6.9 thousand people is.

$$\begin{array}{r} 6.9 \rightarrow 7 \\ \times 2.2 \rightarrow \times 2 \\ \hline \end{array}$$

14 million people

Then point out the multiplication in decimals and in fractions. Recall that tenths times tenths equals hundredths. Point out, too, the number of decimal places in the factors and in the product.

Put the following series of examples on the chalkboard.

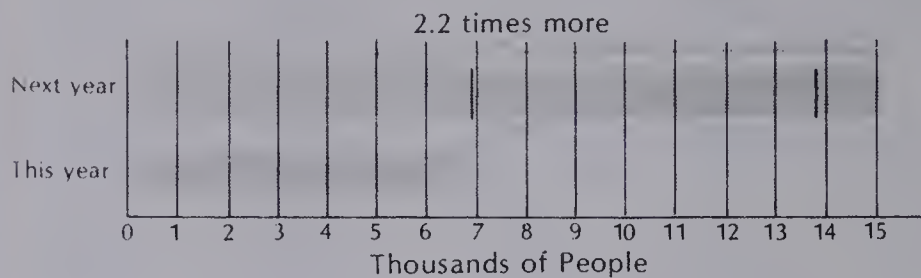
$\begin{array}{r} 345 \\ \times 23 \\ \hline \end{array}$	$\begin{array}{r} 34.5 \\ \times 23 \\ \hline \end{array}$	$\begin{array}{r} 34.5 \\ \times 2.3 \\ \hline \end{array}$
$\begin{array}{r} 345 \\ \times 231 \\ \hline \end{array}$	$\begin{array}{r} 34.5 \\ \times 231 \\ \hline \end{array}$	$\begin{array}{r} 34.5 \\ \times 23.1 \\ \hline \end{array}$

Have the students try to verify that the number of decimal places in the products is the same as the number of decimal places in the factors as they find the product patterns.

Stress the importance of estimating the product. Ask questions such as:
 "Is 4.4×1.8 equal to 792, 79.2, or 7.92?
 Is 2.7×13 equal to 351, 35.1, or 3.51?
 Is 0.8×9.6 equal to 7.68 or 0.768?"

Multiplying Decimals

This year 6.9 thousand people attended a math convention in Winnipeg. Next year, the organizers expect 2.2 times as many people in Toronto. How many people do they expect to come next year?



$$\begin{array}{r} 6.9 \\ \times 2.2 \\ \hline 138 \\ 1380 \\ \hline 15.18 \end{array}$$

1 decimal place
1 decimal place
2 decimal places

or

$$\frac{69}{10} \times \frac{22}{10} = \frac{1518}{100} = 15.18$$

Check by estimating:

$$7 \times 2 = 14$$

They expect about 15 thousand people next year.

EXERCISES

Multiply.

1. $\frac{6}{10} \times 3\frac{2}{10}$	2. $\frac{3}{10} \times 4\frac{1}{10}$	3. $1\frac{5}{10} \times 2\frac{1}{10}$	4. $8\frac{2}{10} \times 2\frac{3}{10}$
5. 3.2×0.6	6. 4.1×0.3	7. 2.1×1.5	8. 2.3×8.2
9. 4.3×0.5	10. 4.3×1	11. 4.3×1.5	12. 4.3×2

Multiply. Check by estimating.

13. 5.3×0.4	14. 5.3×2.4	15. 6.7×0.8	16. 6.7×3.8
----------------------	----------------------	----------------------	----------------------

Using the Exercises

- Questions 1 to 8 require students to multiply fractions and mixed numerals with denominators of 10 first. Then these same multiplications must be done in decimal form. Have the students compare their two sets of results.
- Questions 9 to 16 require the students to multiply without any aid. Only the last four need have the reasonableness of their products checked by estimating; however, many students would benefit by doing this for all eight multiplications.

PRACTICE

Find the product.

1. $3.2 \times 0.2 = 0.64$
2. $5.8 \times 7 = 40.6$
3. $6.8 \times 9.3 = 63.24$
4. $4.5 \times 0.6 = 2.7$
5. $3.9 \times 12 = 46.8$
6. $8.1 \times 7 = 56.7$
7. $6.7 \times 5.5 = 36.85$
8. $5.9 \times 17 = 100.3$
9. $1.4 \times 8.2 = 11.48$
10. $7.2 \times 0.5 = 3.60$
11. $7.8 \times 3.7 = 28.86$
12. $8.8 \times 0.2 = 1.76$
13. $6.9 \times 6.9 = 47.61$
14. $5.3 \times 72 = 381.6$
15. $3.9 \times 4.1 = 15.99$

Solve.

16. Maria can run 1 km in 6.7 min. If she keeps the same pace, how long will it take her to run 2.5 km? 16.75 min
17. Mr. Dalos put \$12 000 in a bank savings account ten years ago. Today he has 2.3 times that amount because of the interest the money earned. How much money does he have now? $\$27\,600$

Copy and complete.

18.	In	Out	19.	In	Out	20.	In	Out
	N	$N \times 3.4$		N	$(N - 0.6) \times 7.5$		N	$(N + 0.2) \times 1.2$
	5.2	17.68		1.9	9.75		0.3	0.60
	0.4	1.36		3.7	23.25		5.6	6.96
	6.7	22.78		5.8	39.00		2.9	3.72

Letter Logic

Each letter stands for a different digit.
Find their values and check by multiplying.

$$\begin{aligned} A &= 1 \\ B &= 3 \\ C &= 9 \\ D &= 6 \end{aligned}$$

$$\begin{array}{r} A.B \\ \times A.B \\ \hline BC \\ AB \\ \hline A.DC \end{array}$$

183

Assigning the Practice

Minimum: 1-16

Average: 6-20

Enriched: 6-20

Reinforcement

1. Assign *Letter Logic* at the bottom of page 183.
2. Write the following on the chalkboard. Ask the students to match them without performing the calculation.

- a. $\frac{3}{10} \times \frac{7}{10}$ 1. 4.73×5.26
- b. $\frac{43}{10} \times \frac{25}{10}$ 2. 2.6×3.2
- c. $\frac{473}{100} \times \frac{526}{100}$ 3. 0.3×0.7
- d. $\frac{52}{10} \times \frac{64}{10}$ 4. 5.2×6.4
- e. $\frac{26}{10} \times \frac{32}{10}$ 5. 4.3×2.5

3. Ask the students to calculate the above products. Discuss which method is easier.

Enrichment

Have the students investigate these products.

- a. $\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$
- b. $0.1 \times 0.1 \times 0.1$
- c. $\frac{2}{10} \times \frac{7}{10} \times \frac{4}{10}$
- d. $0.2 \times 0.7 \times 0.4$
- e. $\frac{9}{10} \times \frac{8}{10} \times \frac{5}{10}$
- f. $0.9 \times 0.8 \times 0.5$

Extra Practice

Worksheet A44

Pages 182-183

Multiply.

1. $1.7 \times 0.8 = 1.36$
2. $2.6 \times 6 = 15.6$
3. $4.5 \times 5.4 = 24.3$
4. $3.9 \times 2.6 = 10.14$
5. $8.2 \times 0.7 = 5.74$
6. $9.3 \times 4.2 = 39.06$
7. $6.1 \times 3.7 = 22.57$
8. $9.8 \times 5 = 49.0$
9. $7.6 \times 2.7 = 20.52$
10. $5.1 \times 4.8 = 24.48$
11. $5.8 \times 2.8 = 16.24$
12. $4.9 \times 6 = 29.4$
13. $8.3 \times 1.1 = 9.13$
14. $2.6 \times 0.7 = 1.82$
15. $3.5 \times 5.9 = 20.65$

Solve.

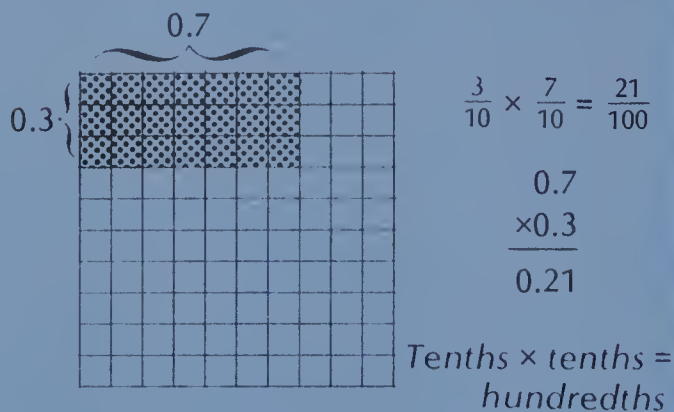
16. What is the area of a rectangular room 8.7 m long and 6.5 m wide? 56.55 m^2

Objective A45

Multiply a decimal less than 1 in hundredths by a decimal less than 1 in tenths.

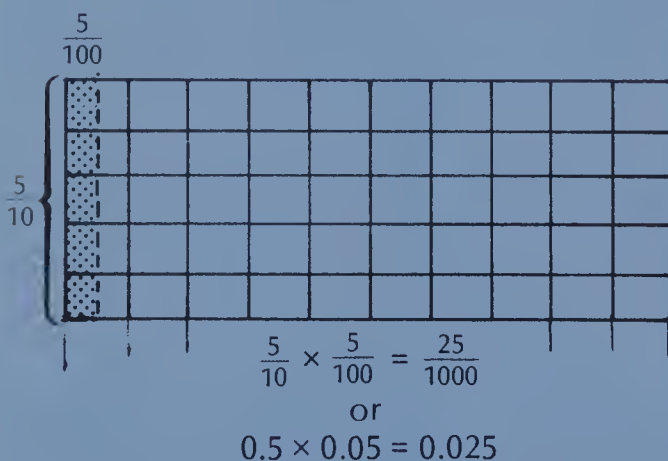
Introducing the Lesson

Sketch the following diagram on the chalkboard to review the multiplication of decimals in tenths.



Teaching the Lesson

Discuss the problem of the real estate agent's commission at the top of page 184. Sketch the following diagram to illustrate the multiplication. Point out the multiplication in both fractions and decimals so the students see that *tenths \times hundredths = thousandths*.



Explain that if the real estate agent received 0.025 of the money paid for the house as commission, this amount is equal to \$25 for each \$1000 of the price of the house. Have the students calculate the amount of commission, at that rate, the agent would get if he or she sold a \$80 000, \$100 000, and a \$150 000 house.

Provide practice of other multiplications of decimals in tenths and in hundredths.

Multiplying Decimals

When a house is sold, 0.05 of the selling price for the house goes to the real estate company. Half of the real estate company's money goes to the agent who sold the house. What part of the money paid for the house does the real estate agent receive?



Half of 0.05

$$\begin{array}{r} 0.5 \\ \times 0.05 \\ \hline 0.025 \end{array}$$

1 decimal place
2 decimal places
3 decimal places

or

$$\frac{5 \times 5}{10 \times 100} = \frac{25}{1000}$$

The agent receives 0.025 of the money paid.

tenths \times hundredths \rightarrow thousandths

EXERCISES

Multiply

1. $\frac{6}{10} \times \frac{2}{100} = \frac{12}{2000}$ or $\frac{3}{280}$	2. $\frac{2}{10} \times \frac{3}{100} = \frac{6}{500}$	3. $\frac{5}{10} \times \frac{9}{100} = \frac{45}{200}$	4. $\frac{3}{10} \times \frac{3}{100} = \frac{9}{1000}$
5. $0.02 \times 0.6 = 0.012$ ($\frac{24}{1000}$ or $\frac{3}{125}$)	6. $0.03 \times 0.2 = 0.006$ ($\frac{105}{1000}$ or $\frac{21}{200}$)	7. $0.09 \times 0.5 = 0.045$ ($\frac{192}{1000}$)	8. $0.03 \times 0.3 = 0.009$ ($\frac{390}{1000}$)
9. $\frac{3}{10} \times \frac{8}{100} = \frac{24}{125}$	10. $\frac{7}{10} \times \frac{15}{100} = \frac{21}{200}$	11. $\frac{6}{10} \times \frac{32}{100} = \frac{24}{125}$	12. $\frac{5}{10} \times \frac{78}{100} = \frac{39}{100}$
13. $0.08 \times 0.3 = 0.024$	14. $0.15 \times 0.7 = 0.105$	15. $0.32 \times 0.6 = 0.192$	16. $0.78 \times 0.5 = 0.390$
17. $0.55 \times 0.6 = 0.330$	18. $0.74 \times 0.8 = 0.592$	19. $0.91 \times 0.4 = 0.364$	20. $0.37 \times 0.9 = 0.333$

Using the Exercises

- Questions 1 to 16 are related multiplications. First the students are required to multiply fractions and then the same values are multiplied as decimals. Students can use these examples to verify the need for three decimal places in the products.
- Questions 17 to 20 require the students to multiply decimals in hundredths by decimals in tenths without any aid.

PRACTICE

Find the product.

1. $0.14 \times 0.2 = 0.028$
2. $0.06 \times 0.1 = 0.006$
3. $0.57 \times 9 = 5.13$
4. $0.48 \times 0.2 = 0.096$
5. $0.62 \times 0.5 = 0.310$
6. $0.04 \times 0.2 = 0.008$
7. $0.05 \times 0.8 = 0.040$
8. $0.98 \times 0.2 = 0.196$
9. $0.09 \times 0.1 = 0.009$
10. $0.47 \times 6 = 2.82$
11. $0.38 \times 16 = 6.08$
12. $0.02 \times 0.1 = 0.002$
13. $0.83 \times 7 = 5.81$
14. $0.31 \times 0.6 = 0.186$
15. $0.29 \times 48 = 13.92$

Copy and compare. Use $<$, $=$, or $>$.

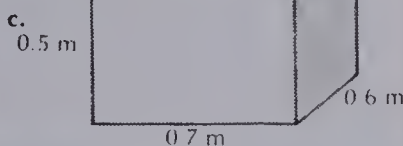
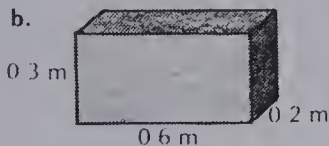
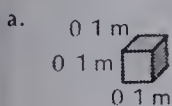
16. $0.2 \times 0.2 \blacksquare 0.95 - 0.91$
17. $0.01 \times 0.7 \blacksquare 0.5 + 0.2$
18. $15.1 - 15.09 \blacksquare 0.1 \times 0.1$
19. $0.5 \times 0.32 \blacksquare 0.25 - 0.09$
20. $3.2 - 3.09 \blacksquare 0.5 \times 0.02$
21. $0.9 \times 0.02 \blacksquare 0.09 + 0.09$

22. Copy and complete.

\times	10	0.5	0.8	900	842	10.3	40.7
10	100	5	8	9000	8420	103	407
1	10	0.5	0.8	900	842	10.3	40.7
0.1	1	0.05	0.08	90	84.2	1.03	4.07
0.01	0.1	0.005	0.008	9	8.42	0.103	0.407

Three Factors

Find the volume of each box.



$$\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} = \frac{1}{1000} = 0.001$$

$$\text{Or, } 0.1 \times 0.1 \times 0.1 = 0.001$$

Volume = $\blacksquare \text{ m}^3$
0.001

$$\frac{6}{10} \times \frac{3}{10} \times \frac{2}{10} = \frac{36}{1000} = 0.036$$

$$\text{Or, } 0.6 \times 0.3 \times 0.2 = 0.036$$

Volume = $\blacksquare \text{ m}^3$
0.036

$$\frac{5}{10} \times \frac{6}{10} \times \frac{7}{10} = \frac{210}{1000} = 0.210$$

$$\text{Or, } 0.5 \times 0.6 \times 0.7 = 0.210$$

Volume = $\blacksquare \text{ m}^3$
0.210

185

Assigning the Practice

Minimum: 1-19

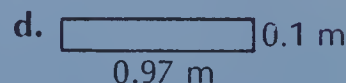
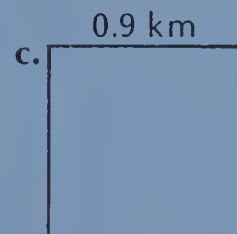
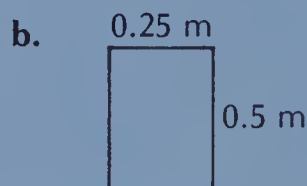
Average: 6-22

Enriched: 6-22

Reinforcement

1. Assign *Three Factors* at the bottom of page 185.

2. Have the students find the areas of the following rectangles.



Enrichment

Let the students investigate the products of multiplications requiring more than three decimal places with these activities.

a. Complete.

\times	352	35.2	3.52	0.352
23				
2.3				
0.23				

b. Work each multiplication. Then write the problem letter beside each answer to decode a word.

- E 0.04×0.006
R 0.4×0.06
T 4×0.6
G 0.04×0.06
A 0.4×0.6

0.0024	
0.024	
0.00024	
0.24	
2.4	

Extra Practice

Find the product.

1. $0.24 \times 0.8 = 0.192$
2. $0.35 \times 0.7 = 0.245$
3. $0.46 \times 0.6 = 0.276$
4. $0.75 \times 0.4 = 0.300$
5. $0.66 \times 8 = 5.28$
6. $0.97 \times 0.1 = 0.097$
7. $0.68 \times 0.5 = 0.340$
8. $0.19 \times 0.2 = 0.038$
9. $0.27 \times 3 = 0.81$
10. $0.84 \times 0.6 = 0.504$
11. $0.38 \times 0.3 = 0.114$
12. $0.73 \times 5 = 3.65$
13. $0.64 \times 0.4 = 0.256$
14. $0.47 \times 4 = 1.88$
15. $0.86 \times 0.6 = 0.516$

Complete.

X	42	38.4	0.5	1.9	700	0.2	97
10	420	384	5	19	7000	2	970
1	42	38.4	0.5	1.9	700	0.2	97
0.1	4.2	3.84	0.05	0.19	70.0	0.02	9.7
0.01	0.42	0.384	0.005	0.019	7	0.002	0.97

Worksheet A45

Pages 184-185

Objective A46

Multiply a decimal greater than 1 in hundredths by a decimal greater than 1 in tenths.

Introducing the Lesson

Ask the students to find the following products.

a. $\frac{3}{10} \times \frac{2}{10}$ b. $\frac{2}{10} \times \frac{4}{100}$

Then have them rewrite the multiplications in decimals and use the fraction multiplications to verify the placement of the decimal points in the products.

Teaching the Lesson

Ask the students to repeat the procedure they used in the introduction to the lesson for the following example. Point out that both methods yield the same product.

$$1\frac{1}{10} \times 2\frac{2}{100}$$

$$\frac{11}{10} \times \frac{202}{100} = \frac{2222}{1000} \quad \text{or} \quad 2\frac{222}{1000}$$

or

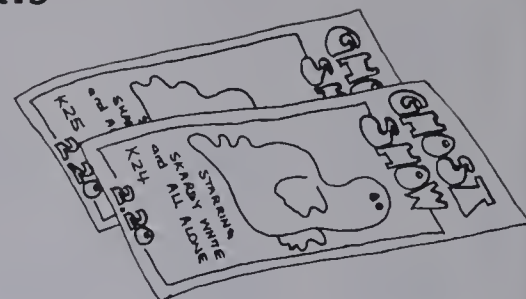
$$\begin{array}{r} 2.02 \\ \times 1.1 \\ \hline 202 \\ 220 \\ \hline 2.222 \end{array}$$

Read and discuss the problem at the top of page 186. Show the related decimal and fraction multiplications. Have the students explain why three decimal places are needed in the product.

Devise other word problems involving an increase in price for the students to solve by multiplying. Work the solutions in both fractions and decimals. Ask the students to say which is easier to use and why.

Multiplying Decimals

Tickets at a theatre cost \$2.20 each. Production costs have gone up by 1.7 times. The manager has decided to raise ticket prices at the same rate. What will the new ticket price be?



$$1.7 \times \$2.20 = \blacksquare$$

$$\begin{array}{r} 1.7 \\ \times 2.20 \\ \hline 1540 \\ 2200 \\ \hline 3.740 \end{array}$$

2 decimal places
1 decimal place
3 decimal places

or

$$\frac{17}{10} \times \frac{220}{100} = \frac{3740}{1000} = 3.740$$

Check by estimating:

$$2 \times \$2 = \$4$$

The new price will be \$3.74.

EXERCISES

Multiply: $(\frac{1005}{1000} \text{ or } 1\frac{1}{200})$ $(\frac{606}{1000} \text{ or } \frac{303}{500})$ $(\frac{1442}{1000} \text{ or } 1\frac{221}{500})$ $(\frac{6622}{1000} \text{ or } 6\frac{311}{500})$

1. $\frac{5}{10} \times 2\frac{1}{100}$ 2. $\frac{3}{10} \times 2\frac{2}{100}$ 3. $1\frac{4}{10} \times 1\frac{3}{100}$ 4. $2\frac{2}{10} \times 3\frac{1}{100}$

$$\begin{array}{r} 2.01 \\ \times 0.5 \\ \hline 1.005 \end{array}$$

$$\begin{array}{r} 2.02 \\ \times 0.3 \\ \hline 0.606 \end{array}$$

$$\begin{array}{r} 1.03 \\ \times 1.4 \\ \hline 1.442 \end{array}$$

$$\begin{array}{r} 3.01 \\ \times 2.2 \\ \hline 6.622 \end{array}$$

$$\begin{array}{r} 3.48 \\ \times 0.5 \\ \hline 1.740 \end{array}$$

$$\begin{array}{r} 3.48 \\ \times 1.5 \\ \hline 5.220 \end{array}$$

$$\begin{array}{r} 3.48 \\ \times 2.5 \\ \hline 8.700 \end{array}$$

$$\begin{array}{r} 3.48 \\ \times 3.5 \\ \hline 12.180 \end{array}$$

Estimate the answer, then multiply.

$$\begin{array}{r} 4.07 \\ \times 5.8 \\ \hline 23.606 \end{array}$$

$$\begin{array}{r} 3.89 \\ \times 6.1 \\ \hline 23.729 \end{array}$$

$$\begin{array}{r} 9.91 \\ \times 1.7 \\ \hline 16.847 \end{array}$$

$$\begin{array}{r} 6.03 \\ \times 4.2 \\ \hline 25.326 \end{array}$$

$$\begin{array}{r} \$6.54 \\ \times 7.2 \\ \hline \$47.088 \end{array}$$

$$\begin{array}{r} \$8.49 \\ \times 6.5 \\ \hline \$55.185 \end{array}$$

$$\begin{array}{r} \$4.88 \\ \times 5.6 \\ \hline \$27.328 \end{array}$$

$$\begin{array}{r} \$7.61 \\ \times 8.4 \\ \hline \$63.924 \end{array}$$

Using the Exercises

- Questions 1 to 8 are related fraction and decimal multiplications. Students can use the fraction multiplication to check the placement of the decimal points in their products.
- Questions 9 to 12 involve multiplying decimals without the aid of a related fraction multiplication.
- Questions 13 to 20 require the students to first estimate the products. The reasonableness of the products can then be verified. Note that the last four multiplications require a dollar sign in the products.

PRACTICE

Find the product.

1. $5.77 \times 0.4 = 2.308$
2. $4.69 \times 1.2 = 5.628$
3. $26.8 \times 0.14 = 3.752$
4. $3.58 \times 2.5 = 8.950$
5. $6.85 \times 3.2 = 21.920$
6. $65.6 \times 35 = 2296.0$
7. $4.25 \times 3.3 = 14.025$
8. $875 \times 6.12 = 5355.00$
9. $1.51 \times 0.2 = 0.302$
10. $15.9 \times 2.13 = 33.867$
11. $895 \times 1.2 = 1074.0$
12. $63.8 \times 4.09 = 260.942$
13. $4.77 \times 22 = 104.94$
14. $3.98 \times 4.3 = 17.114$
15. $422 \times 1.08 = 455.76$

Simplify.

16. $1.2 + 4.3 \times 0.5 = 3.35$
17. $95 - 6.1 \times 5.1 = 63.89$
18. $5.21 \times (4.1 + 2.6) = 34.907$
19. $42.3 \times (7.5 - 1.04) = 273.258$
20. $200 - 3.1 \times 0.1 = 199.69$
21. $8.8 + 7.2 \times 0.02 = 8.944$

Copy and complete.

22.	In	Out
	N	$N \times 1.01$
	3.5	3.535
	8	8.08
	46	46.46

23.	In	Out
	N	$(N + 1.2) \times 6.25$
	3	26.25
	12	82.50
	50	320.00

24.	In	Out
	N	$(N - 6.25) \times 1.2$
	14	9.3
	25	22.5
	80	88.5

Assigning the Practice

Minimum: 1-21

Average: 6-23

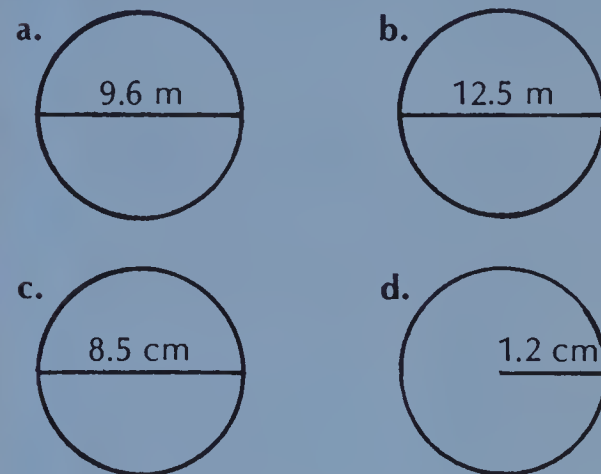
Enriched: 9-24

Reinforcement

1. Place the decimal point in the first factor of each multiplication.

- a. $435 \times 0.3 = 130.5$
- b. $17 \times 0.4 = 6.8$
- c. $89 \times 0.43 = 38.27$
- d. $278 \times 3.9 = 1084.2$
- e. $345 \times 0.7 = 241.5$
- f. $431 \times 0.02 = 8.62$

2. Find the circumferences of the following circles using 3.14 as π .



Enrichment

1. Assign *Using the Calculator* at the bottom of page 187.

2. Find the areas of the circles in Reinforcement 2 above.

3. Name the missing factors.

- a. $6 \times \square = 0.030$
- b. $0.03 \times \square = 0.036$
- c. $0.6 \times \square = 0.036$
- d. $30 \times \square = 0.036$
- e. $0.06 \times \square = 0.036$
- f. $0.003 \times \square = 0.036$
- g. $0.2 \times \square = 0.036$
- h. $10 \times \square = 0.036$
- i. $0.02 \times \square = 0.036$
- j. $0.1 \times \square = 0.036$
- k. $0.4 \times \square = 0.036$
- l. $0.01 \times \square = 0.036$
- m. $4 \times \square = 0.036$
- n. $0.001 \times \square = 0.036$
- o. $0.004 \times \square = 0.036$
- p. $100 \times \square = 0.036$

187

USING THE CALCULATOR

1. a. Enter: $\square 5 \times \square 5 =$
 - b. Enter: $\square 5 \times =$
- What is the answer in both cases?

2. Enter: $\square 5 \times$
 - Push $=$ once. Once more.
- And again. What happens?

Calculate.

3. $0.5^2 = 0.25$
4. $0.5^3 = 0.125$
5. $0.2^2 = 0.04$
6. $0.2^3 = 0.008$
7. $0.9^2 = 0.81$
8. $0.05^2 = 0.0025$
9. $0.09^2 = 0.0081$
10. $0.2^4 = 0.0016$
11. $0.1^2 = 0.01$
12. $0.1^3 = 0.001$
13. $0.01^3 = 0.000001$
14. $0.1^7 = 0.0000001$

Extra Practice

Multiply.

1. $4.22 \times 0.8 = 3.376$
2. $2.69 \times 45 = 121.05$
3. $7.01 \times 3.8 = 26.638$
4. $9.2 \times 1.4 = 12.88$
5. $6.12 \times 1.5 = 9.180$
6. $3.47 \times 8.2 = 28.454$
7. $94.8 \times 6 = 568.8$
8. $3.17 \times 8.2 = 25.994$
9. $3.8 \times 29 = 110.2$
10. $4.81 \times 5.6 = 26.936$
11. $2.07 \times 0.3 = 0.621$
12. $5.23 \times 84 = 439.32$

Solve.

1. If grapes cost \$3.89/kg, how much would 1.6 kg cost? **\$6.22**
2. If a loaf of bread cost \$1.17, how much would 4 loaves cost? **\$4.68**

Worksheet A46

Pages 186-187

UNIT 8 LESSON 10

Objective PS8

Make a table or diagram to help solve a word problem.

Introducing the Lesson

Discuss the uses of tables with the students. Point out that tables organize data or collections of information so that it is easier to analyze, interpret, and draw conclusions. Tables are especially useful in displaying patterns and relationships.

Teaching the Lesson

Discuss the problem presented at the top of page 188. On an overhead projector, model the various possible rectangular arrangements of the hurdles with toothpicks. Point out the usefulness of the table for recording the data of each arrangement in an orderly way. Show how the table makes the solution to the problem clearly visible.

Show these four regular solids: tetrahedron, hexahedron (cube), octahedron, and dodecahedron. Ask, "How many edges does each have?" Count the faces, vertices, and edges of the tetrahedron and hexahedron. Record the information in a table. Students should realize that the number of edges in the remaining two regular solids can be found without counting. It is the sum of the number of faces and vertices minus 2.

Regular Solid	Faces	Vertices	Edges
tetrahedron	4	4	6
hexahedron (cube)	6	8	12
octahedron	8	6	12
dodecahedron	12	20	30

Point out the problem and the table used to solve it at the bottom of page 63. If only a few students solved this enrichment problem earlier, discuss its solution now.

Explain that the problems on pages 188 and 189 also will be more easily solved if a table is made.

Using a Table

A horse trainer used 24 hurdles to make a temporary enclosure. She arranged them in a rectangle so that the area was as large as possible. How did she arrange them?

Make a table to solve the problem.

Perimeter	Length	Width	Area
24	11	1	11
24	10	2	20
24	9	3	27
24	8	4	32
24	7	5	35
24	6	6	36

The trainer arranged the hurdles in a square with 6 hurdles on each side.



EXERCISES

- Find the rectangular arrangement of 34 hurdles that gives the largest possible area. **Rectangle - 9 by 8**
- Find the smallest perimeter of a rectangle that has an area of 48 cm². Each side must be an exact number of centimetres in length. **28 cm 8 cm x 6 cm**

- How many squares are there in the diagram? **14**
- How many rectangles are there in the diagram? **22**



188

Using the Exercises

- Questions 1 and 2 require the students to make a table similar to the lesson example. Note, however, that question 1 asks for the largest possible area and that question 2 asks for the smallest possible perimeter.
- Questions 3 and 4 also require a table so that the problem can be solved. For example, a table for question 3 could look like this.

Kind of square	1 cm x 1 cm	2 cm x 2 cm	3 cm x 3 cm
Number of squares	9	4	1

Total number of squares = 14

PRACTICE

- The grades in Reading for Mrs. Wonder's class are:
A, B, B, C, A, D, C, B, A, C, C, D, B, C, C, A, D, B, C, A, C, B,
B, and C. What grade was received most often? **C**
- The sum of the three angles of a triangle is 180° .
The sum of the four angles of a quadrilateral is 360° .
The sum of the five angles of a pentagon is 540° .
What is the sum of the eight angles of an octagon? **1080°**
- The sum of the first two odd numbers ($1 + 3$) is 4.
The sum of the first three odd numbers ($1 + 3 + 5$) is 9.
 - Find the sum of the first four, five, and six odd numbers. **16, 25, 36**
 - Predict the sum of the first 8 odd numbers. **64**
 - Predict the sum of the first 10 odd numbers. **100**

REVIEW

Multiply.

A42	1. $\begin{array}{r} 3.8 \\ \times 6 \\ \hline 22.8 \end{array}$	2. $\begin{array}{r} 4.02 \\ \times 3 \\ \hline 12.06 \end{array}$	3. $\begin{array}{r} 7.001 \\ \times 8 \\ \hline 56.008 \end{array}$	4. $\begin{array}{r} 6.023 \\ \times 4 \\ \hline 24.092 \end{array}$
A43	5. $\begin{array}{r} 0.1 \\ \times 0.1 \\ \hline 0.01 \end{array}$	6. $\begin{array}{r} 0.3 \\ \times 0.4 \\ \hline 0.12 \end{array}$	7. $\begin{array}{r} 0.6 \\ \times 0.8 \\ \hline 0.48 \end{array}$	8. $\begin{array}{r} 0.2 \\ \times 0.3 \\ \hline 0.06 \end{array}$
A44	9. $\begin{array}{r} 1.2 \\ \times 3.2 \\ \hline 3.84 \end{array}$	10. $\begin{array}{r} 6.3 \\ \times 5.1 \\ \hline 32.13 \end{array}$	11. $\begin{array}{r} 4.5 \\ \times 6.7 \\ \hline 30.15 \end{array}$	12. $\begin{array}{r} 9.8 \\ \times 8.9 \\ \hline 87.22 \end{array}$
A45	13. $\begin{array}{r} 0.01 \\ \times 0.1 \\ \hline 0.001 \end{array}$	14. $\begin{array}{r} 0.07 \\ \times 0.8 \\ \hline 0.056 \end{array}$	15. $\begin{array}{r} 0.02 \\ \times 0.3 \\ \hline 0.006 \end{array}$	16. $\begin{array}{r} 0.09 \\ \times 0.5 \\ \hline 0.045 \end{array}$
A46	17. $\begin{array}{r} 5.02 \\ \times 4.1 \\ \hline 20.582 \end{array}$	18. $\begin{array}{r} 9.85 \\ \times 6.4 \\ \hline 63.04 \end{array}$	19. $\begin{array}{r} 5.43 \\ \times 7.5 \\ \hline 40.725 \end{array}$	20. $\begin{array}{r} 7.01 \\ \times 9.1 \\ \hline 63.791 \end{array}$

189

Assigning the Practice

Minimum: 1-3

Average: 1-3

Enriched: 1-3

Review Exercises

Questions	Objective	Pages
1-4	A42	178-179
5-8	A43	180-181
9-12	A44	182-183
13-16	A45	184-185
17-20	A46	186-187













Reinforcement

Show the students how to use the following tables to do the given tasks.

- a. Toss a nickel and a penny. What are the chances of tossing two heads?

5¢	1¢
head	tail
tail	head
tail	tail
head	head

- b. The table shows all possible sums that occur in the rolling of two dice.

						
	1	2	3	4	5	6
	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9
	5	6	7	8	9	10
	6	7	8	9	10	11
	7	8	9	10	11	12

- Which sum is the smallest? largest?
Which sum occurs most often? least often?
Which sums occur 4 out of 36 times?
2 out of 36 times?

Enrichment

Have the students bring in tables of value from newspapers and magazines. Discuss them and have the students make up questions from them for the class to answer.

Problem Solving Activities

Assign Level 6, Unit 8

Extra Practice

Worksheet PS8

Pages 188-189

Solve. Make a table to help you.

- A rectangular component needs to have an area of 24 mm^2 and the smallest possible perimeter. What should be the dimensions of the component? **6 mm long, 4 mm wide**
- Two dice are used. How many different ways are there to throw a seven? **6**
- A family has four children. How many different combinations of boys and/or girls could they have? **GGGG, GGGB, GGBB, GBBB, BBBB - 4 combinations**
- The students in the Camera Club are the following ages: 13, 12, 12, 9, 11, 10, 12, 11, 12, 11, 10, 11, 12, and 13. What age are most of the students? **5 students are 13 years old**
- Which is the best buy: 63¢ for 25 mL of toothpaste, **\$1.15 for 50 mL**, or \$1.80 for 75 mL?

Unit 8 Objective	Test Questions	Pages
A39	1-4	170-171
A40	5-8	172-173
A41	9-12	174-175
A42	13-16	178-179
A43	17-20	180-181
A44	21-24	182-183
A45	25-28	184-185
A46	29-32	186-187
PS	33-34	

TEST

UNIT 8

Multiply. Write the answer in simplest terms.

- $\frac{3}{5} \times 14 = 8\frac{2}{5}$
- $20 \times \frac{5}{6} = 16\frac{2}{3}$
- $28 \times \frac{3}{8} = 10\frac{1}{2}$
- $\frac{3}{4} \times 34 = 25\frac{1}{2}$
- $\frac{2}{3} \times \frac{7}{8} = \frac{7}{12}$
- $\frac{5}{6} \times \frac{8}{9} = \frac{20}{27}$
- $\frac{3}{8} \times \frac{6}{7} = \frac{9}{28}$
- $\frac{4}{5} \times \frac{5}{6} = \frac{2}{3}$
- $6 \times 3\frac{1}{4} = 19\frac{1}{2}$
- $\frac{1}{2} \times 2\frac{2}{3} = 1\frac{1}{3}$
- $5\frac{3}{5} \times 10 = 56$
- $4\frac{1}{8} \times \frac{2}{3} = 2\frac{3}{4}$

Find the product.

- $\begin{array}{r} 3.5 \\ \times 12 \\ \hline 42.0 \end{array}$
- $\begin{array}{r} 6.07 \\ \times 23 \\ \hline 139.61 \end{array}$
- $\begin{array}{r} 5.006 \\ \times 9 \\ \hline 45.054 \end{array}$
- $\begin{array}{r} 3.019 \\ \times 45 \\ \hline 135.855 \end{array}$
- $\begin{array}{r} 0.6 \\ \times 0.1 \\ \hline 0.06 \end{array}$
- $\begin{array}{r} 0.5 \\ \times 0.3 \\ \hline 0.15 \end{array}$
- $\begin{array}{r} 0.2 \\ \times 0.2 \\ \hline 0.04 \end{array}$
- $\begin{array}{r} 0.8 \\ \times 0.9 \\ \hline 0.72 \end{array}$
- $\begin{array}{r} 4.6 \\ \times 6.7 \\ \hline 30.82 \end{array}$
- $\begin{array}{r} 9.8 \\ \times 1.2 \\ \hline 11.76 \end{array}$
- $\begin{array}{r} 8.5 \\ \times 4.3 \\ \hline 36.55 \end{array}$
- $\begin{array}{r} 3.2 \\ \times 7.8 \\ \hline 24.96 \end{array}$
- $\begin{array}{r} 0.03 \\ \times 0.2 \\ \hline 0.006 \end{array}$
- $\begin{array}{r} 0.05 \\ \times 0.7 \\ \hline 0.035 \end{array}$
- $\begin{array}{r} 0.01 \\ \times 0.1 \\ \hline 0.001 \end{array}$
- $\begin{array}{r} 0.68 \\ \times 0.9 \\ \hline 0.612 \end{array}$
- $\begin{array}{r} 2.04 \\ \times 7.1 \\ \hline 14.484 \end{array}$
- $\begin{array}{r} 6.25 \\ \times 3.8 \\ \hline 23.75 \end{array}$
- $\begin{array}{r} 9.02 \\ \times 1.3 \\ \hline 11.726 \end{array}$
- $\begin{array}{r} 6.57 \\ \times 8.7 \\ \hline 57.159 \end{array}$

Solve.

- If your heart beats every 0.75 s (seconds), how long does it take to beat 100 times? 500 times? 1000 times?
 $75s$ $375s$ $750s$
- Estimate the cost of 1.9 kg of meat priced at \$5.39/kg. Find the exact product.
 $\$10.24$

Post-test

Unit 8

Multiply. Write the answer in simplest terms.

- $\frac{3}{4} \times 36 = \frac{27}{1}$
- $45 \times \frac{2}{5} = \frac{18}{1}$
- $\frac{5}{6} \times 42 = \frac{35}{1}$
- $25 \times \frac{2}{3} = \frac{16\frac{2}{3}}{1}$
- $\frac{2}{3} \times \frac{9}{10} = \frac{3}{5}$
- $\frac{3}{7} \times \frac{14}{2} = \frac{3}{1}$
- $\frac{5}{8} \times \frac{3}{10} = \frac{3}{16}$
- $\frac{1}{10} \times \frac{1}{2} = \frac{1}{20}$
- $5 \times 2\frac{1}{2} = \frac{12\frac{1}{2}}{1}$
- $\frac{3}{8} \times 3\frac{1}{3} = \frac{1\frac{1}{4}}{1}$
- $1\frac{5}{6} \times 4 = \frac{7\frac{1}{3}}{1}$
- $\frac{2}{3} \times 8\frac{1}{2} = \frac{5\frac{2}{3}}{1}$

Find the products.

- $\begin{array}{r} 3.5 \\ \times 7 \\ \hline 24.5 \end{array}$
- $\begin{array}{r} 4.08 \\ \times 24 \\ \hline 97.92 \end{array}$
- $\begin{array}{r} 9.123 \\ \times 8 \\ \hline 72.984 \end{array}$
- $\begin{array}{r} 4.257 \\ \times 63 \\ \hline 268.191 \end{array}$
- $\begin{array}{r} 0.6 \\ \times 0.3 \\ \hline 0.18 \end{array}$
- $\begin{array}{r} 0.4 \\ \times 0.2 \\ \hline 0.08 \end{array}$
- $\begin{array}{r} 0.5 \\ \times 0.7 \\ \hline 0.35 \end{array}$
- $\begin{array}{r} 0.8 \\ \times 0.6 \\ \hline 0.48 \end{array}$

Copy and complete.

1. $\frac{1}{2} = \frac{4}{8}$ 2. $\frac{3}{5} = \frac{6}{10}$ 3. $\frac{7}{25} = \frac{28}{100}$ 4. $\frac{4}{9} = \frac{36}{81}$

Write in simplest terms.

5. $\frac{4}{6} \frac{2}{3}$ 6. $\frac{5}{10} \frac{1}{2}$ 7. $\frac{10}{15} \frac{2}{3}$ 8. $\frac{15}{100} \frac{3}{20}$ 9. $\frac{14}{28} \frac{1}{2}$ 10. $\frac{8}{10} \frac{4}{5}$ 11. $\frac{6}{14} \frac{3}{7}$ 12. $\frac{25}{100} \frac{1}{4}$

Copy and complete. Write $>$, $<$, $=$.

13. $\frac{11}{20} > \frac{1}{2}$ 14. $\frac{9}{10} > \frac{4}{5}$ 15. $\frac{12}{15} = \frac{4}{5}$ 16. $\frac{19}{100} < \frac{1}{5}$
17. $\frac{6}{7} < \frac{19}{21}$ 18. $\frac{3}{10} < \frac{31}{100}$ 19. $\frac{2}{3} > \frac{9}{15}$ 20. $\frac{5}{8} = \frac{20}{32}$

Write as a decimal.

21. $\frac{3}{10} 0.3$ 22. $\frac{19}{100} 0.19$ 23. $\frac{7}{100} 0.07$ 24. $\frac{5}{10} 0.5$
25. $\frac{1}{5} 0.2$ 26. $\frac{1}{2} 0.5$ 27. $\frac{3}{25} 0.12$ 28. $\frac{3}{50} 0.06$

Multiply.

29. $\frac{1}{3} \times 15 5$ 30. $\frac{1}{4} \times 28 7$ 31. $\frac{1}{5} \times 65 13$ 32. $\frac{1}{2} \times 36 18$
33. $\frac{2}{3} \times 12 8$ 34. $\frac{3}{8} \times 16 6$ 35. $\frac{4}{5} \times 25 20$ 36. $\frac{2}{5} \times 40 16$
37. $\frac{3}{10} \times 10 3$ 38. $\frac{7}{10} \times 30 21$ 39. $\frac{7}{100} \times 400 28$ 40. $\frac{19}{100} \times 200 38$

Solve.

41. Mary got a $\frac{1}{3}$ discount on her phone bill.
She made \$48 worth of calls.
How much did she have to pay? **\$32**

21. $\begin{array}{r} 6.1 \\ \times 3.4 \\ \hline 20.74 \end{array}$	22. $\begin{array}{r} 7.3 \\ \times 2.1 \\ \hline 15.33 \end{array}$	23. $\begin{array}{r} 5.4 \\ \times 6.7 \\ \hline 36.18 \end{array}$	24. $\begin{array}{r} 8.5 \\ \times 1.6 \\ \hline 13.60 \end{array}$
25. $\begin{array}{r} 0.05 \\ \times 0.3 \\ \hline 0.015 \end{array}$	26. $\begin{array}{r} 0.01 \\ \times 0.6 \\ \hline 0.006 \end{array}$	27. $\begin{array}{r} 0.37 \\ \times 0.7 \\ \hline 0.259 \end{array}$	28. $\begin{array}{r} 0.29 \\ \times 0.8 \\ \hline 0.232 \end{array}$
29. $\begin{array}{r} 5.22 \\ \times 3.4 \\ \hline 17.748 \end{array}$	30. $\begin{array}{r} 7.04 \\ \times 5.2 \\ \hline 36.608 \end{array}$	31. $\begin{array}{r} 3.91 \\ \times 4.6 \\ \hline 17.986 \end{array}$	32. $\begin{array}{r} 8.83 \\ \times 7.2 \\ \hline 63.576 \end{array}$

Solve

33. If a car is travelling at 96 km/h, how far will it go in 15 min? **24 km**
45 min? **72 km** 1 hour and 30 min? **144 km**
34. Estimate the cost of 18 kg of grapes, if the price is \$3.93/kg. **72 km**
Find the exact amount **\$7.07**

UNIT 9

Ratio and Percent

Theme: Around the Neighbourhood

Lesson	Objective		Pages
Preview		Multiply a whole number by a decimal in hundredths.	193
1	A47	Understand the concept of rates involving prices; calculate such rates from given facts.	194-195
2	A48	Understand the concept of rates involving time and speed; calculate such rates from given facts.	196-197
3	N15	Understand the concept of ratio; determine ratios from given facts; interpret ratios as fractional parts and fractional parts as ratios.	198-199
4	N16	Understand the concept of equivalent ratios; calculate such ratios.	200-201
5	PS9	Use a proportion as a strategy in solving problems involving multiplication and division.	202-203
6	N17	Understand the concept of percent; determine percents from given facts.	204-205
7	N18	Express fractions as percents.	206-207
8	N19	Express percents as fractions.	208-209
9	A49	Find a percent of a number using decimals.	210-211
10	PS10	Solve problems involving percents.	212-213
Test		Ratio and Percent	214
Review		Multiplication of Fractions and Decimals	215

About This Unit

In this unit, students will be re-introduced to the meaning of and uses for rates, ratios, and percent. (These topics were first introduced in *Houghton Mifflin Mathematics*, Grade 5.)

Lessons 1 and 2 involve price rates and rates of speed. Both topics are presented in the context of practical situations.

Lessons 3, 4, and 5 involve ratio and proportion. An important prerequisite skill for these lessons is an understanding of equivalent fractions (Unit 7, pages 148-151) and equivalent ratios, for example:

$$\frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4} \quad \text{equivalent fractions and}$$

$$9:12 = 3:4 \quad \text{equivalent ratios}$$

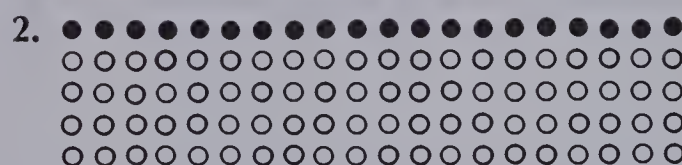
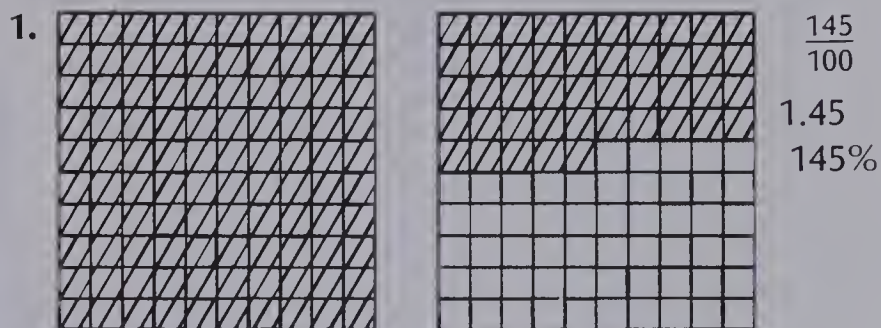
In Lesson 5 students are introduced to the use of a proportion strategy for solving word problems requiring multiplication and division.

Lessons 6, 7, 8, 9, and 10 develop the meaning of percent; explain fraction and decimal equivalents to percent; and reinforce skills in using percent in everyday problem situations.

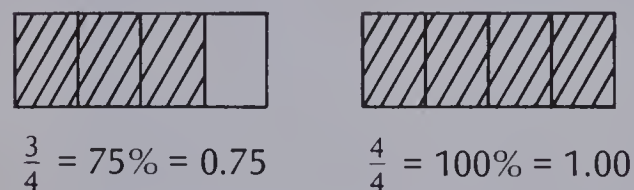
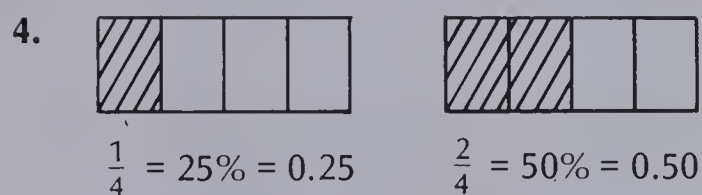
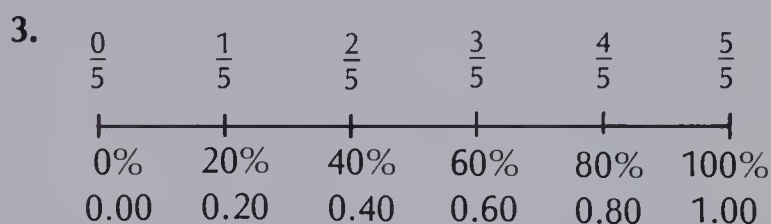
All lessons in this unit begin with a simple, concrete situation or example. The Reinforcement sections often suggest other concrete representations of the topic.

Ideas

Various illustrations can be used to provide easy-to-understand, visual representations of percent, decimal, and fraction equivalents.

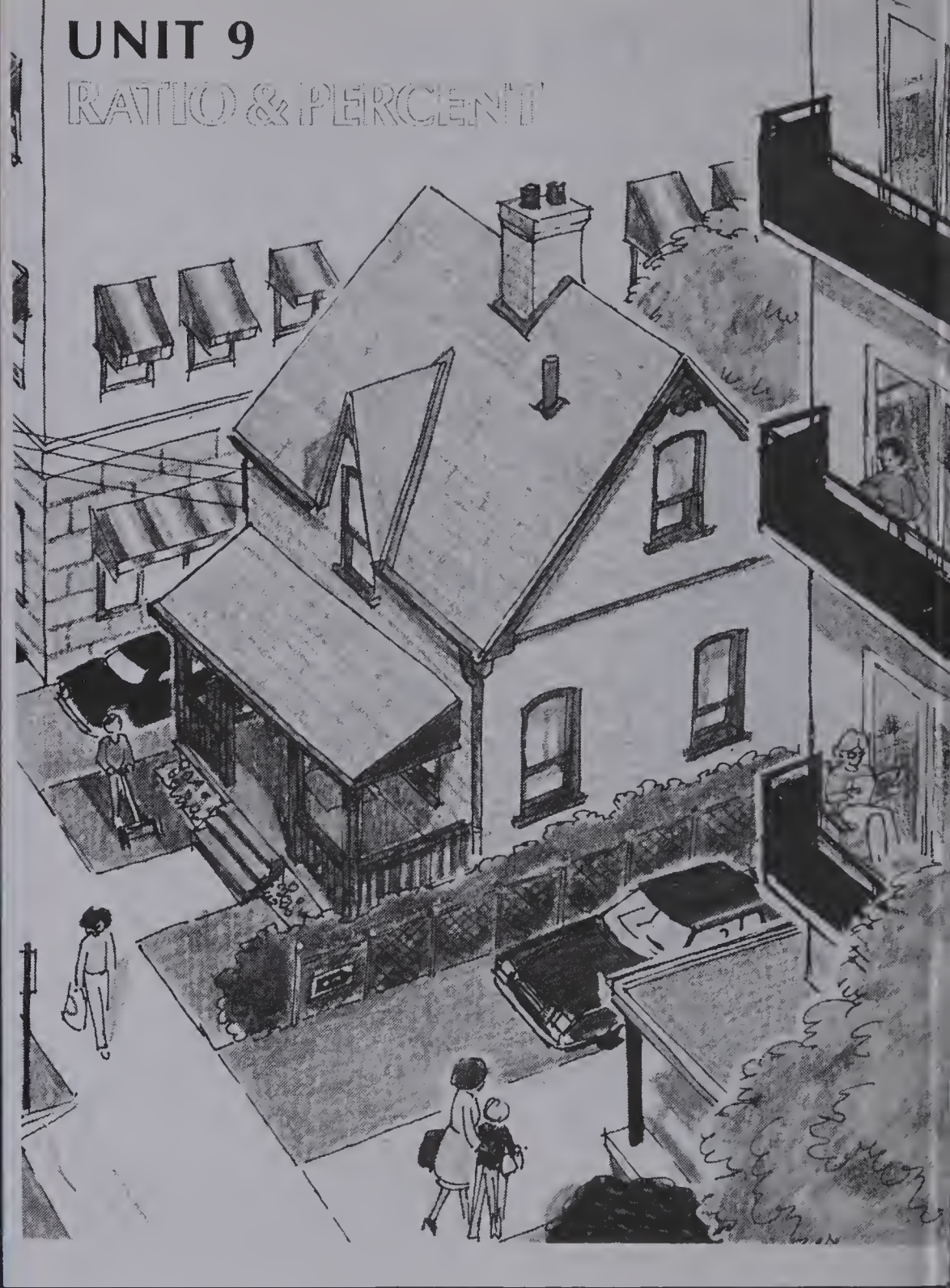


$$\frac{1}{5} = \frac{20}{100} = 20\%$$



UNIT 9

RATIO & PERCENT



Unit 9 Objectives	Test Questions	Pages
A47	1-2	194-195
A48	3-4	196-197
N15	5-8	198-199
N16	9-12	200-201
N17	13-16	204-205
N18	17-20	206-207
N19	21-24	208-209
A49	25-27	210-211
PS	28-29	

Pretest

Unit 9

Solve.

- 2 bags cost \$3.60. What is the cost of one bag? $\$1.80$
- One square metre of rug costs \$18.95. What do 6 m² cost? $\$113.70$
- Angie made 2 bracelets in 45 minutes. How long did it take her to make one bracelet? $22\frac{1}{2}$ min
- A plane goes 237 km/h. How far will it go in 4 h? 948 km

Write a ratio to compare these numbers of objects.

- 5 books to 9 students $5:9$
- 10 people to 2 cars $10:2$
- 6 boys to 8 girls $6:8$
- 9 wins to 2 losses $9:2$

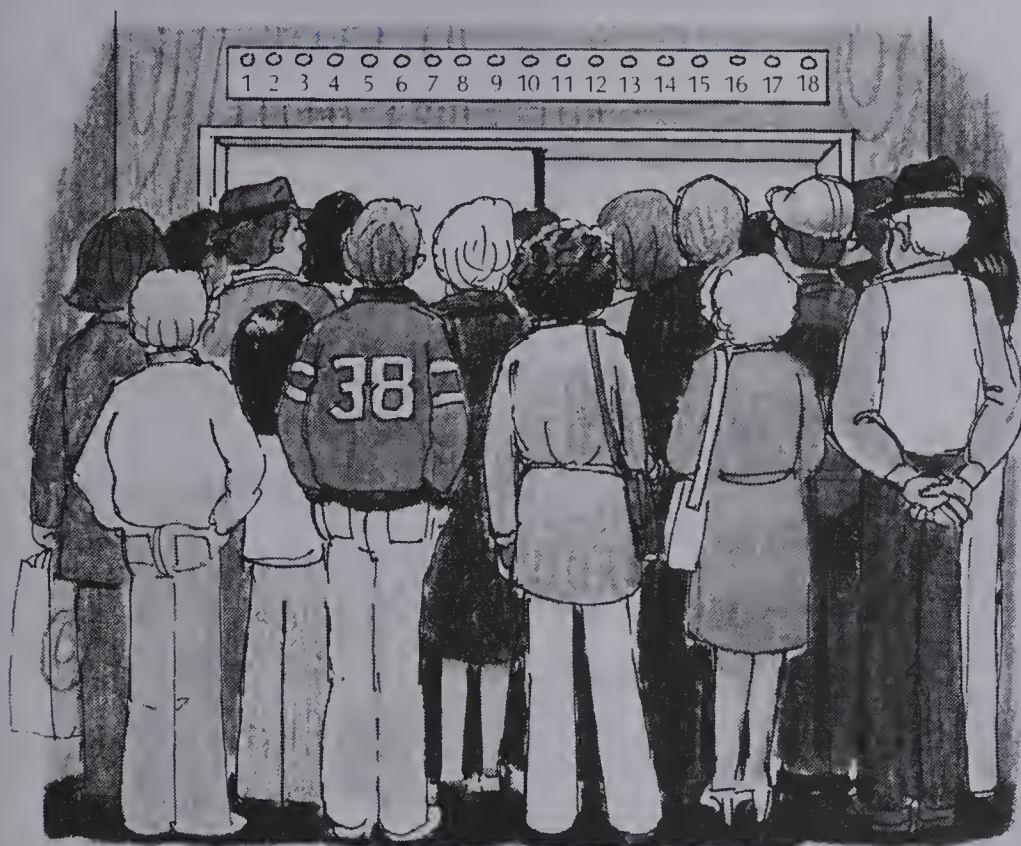
Find the value of N .

- $\frac{3}{8} = \frac{N}{40}$ 15
- $\frac{9}{10} = \frac{81}{N}$ 90
- $\frac{N}{7} = \frac{10}{35}$ 2
- $\frac{5}{N} = \frac{25}{60}$ 12

Find Their Floor

Find each person's floor.

- a. 900×0.02 18 b. 1.50×4 6 c. 3.25×4 13
 d. 12×1.25 15 e. 2×1.50 3 f. 8×1.75 14
 g. 0.24×50 12 h. 4.25×4 17 i. 1.25×4 5



- j. 2.25×4 9 k. 8×0.25 2 l. 8×1.25 10
 m. 64×0.25 16 n. 16×0.25 4 o. 2.75×4 11
 p. 4×1.75 7 q. 100×0.01 1 r. 5×1.60 8

193

Write the equivalent decimal and percent.

13. $\frac{2}{100}$ 0.02 2% 14. $\frac{43}{100}$ 0.43 43% 15. $\frac{90}{100}$ 0.90 90% 16. $\frac{150}{100}$ 1.50 150%

Write the equivalent percent.

17. $\frac{7}{10}$ 70% 18. $\frac{13}{20}$ 65% 19. $\frac{4}{5}$ 80% 20. $\frac{39}{50}$ 78%

Write an equivalent fraction in simplest terms.

21. 10% $\frac{1}{10}$ 22. 1% $\frac{1}{100}$ 23. 37% $\frac{37}{100}$ 24. 70% $\frac{7}{10}$

Calculate.

25. 12% of 300 36 26. 5% of 40 2 27. 20% of 180 36

Solve.

28. Two balls cost \$26.46. How much will 6 balls cost? \$79.38
 29. Twenty-five students are in a class. Fifteen of them are girls. What percent are girls? 60%

UNIT 9

PREVIEW

Suggestions

Use the illustration on page 192 as a starting point for a discussion of neighbourhoods. Talk about the neighbourhood pictured and about neighbourhoods familiar to the students.

About the Page

Point out that the product of each multiplication on page 193 indicates a person's floor number. Before the students attempt the multiplications, ask whether it matters which way each is calculated, e.g., 0.24×50 or 50×0.24 . Lead them to recall that a change in the order of the factors does not affect the product.

Page 193 is designed to provide a review of multiplication with decimals which are often used when calculating with percent.

Reinforcement

Ask the students to complete the multiplication equations involving decimals that describe the illustrations.

- a. $\blacksquare \times 0.5 = 3.5$
 b. $\blacksquare \times 0.25 = \blacksquare$
 c. $6 \times \blacksquare = \blacksquare$

Enrichment

Have the students change each decimal factor of the multiplications on page 193 to a fraction and then multiply. When completed, ask them to discuss which way seemed easier.

UNIT 9 LESSON 1

Objective A47

Understand the concept of rates involving prices; calculate such rates from given facts.

Introducing the Lesson

Show the class a large newspaper ad from a food store. Discuss the prices of the items. Use the term **price rate** as you talk about the ads. Point out rates which give the **unit price** and rates which do not give the unit price.

Teaching the Lesson

Discuss the lesson example on page 194, reviewing the symbol for **per** and its meaning. Have the students practise writing unit prices with the symbol for per, e.g., \$3.99/kg. Ask the students to calculate the cost of more than one kilogram (or metre, etc.) for the unit price items in the newspaper ad.

- Cost of bananas: 98¢/kg.
What is the cost of 2 kg?
- Cost of apples: \$1.69/kg.
What is the cost of 3 kg?

The students should conclude that the cost of more than one unit-priced item can be found by *multiplication*. Have the students extend the grass seed problem on page 194 by completing the following table.

1 kg	2 kg	3 kg	5 kg	10 kg	25 kg
\$4					\$100

Point out the newspaper food ads in which the unit price is not stated, e.g., 4 kg beef cost \$33.12. Discuss how the unit price can be found through *division*. Show how the unit price can be written as \$8.28/kg. Have the students calculate the unit price of several items in the newspaper ads.

Discuss the benefits gained from calculating the unit price when deciding on the better value for a purchase. Ask the students to determine which container of tea is the better buy: 110 g/\$3.30 or 225 g/\$4.50.

Price Rates

Marion Blue grass seed sells for four dollars **per** kilogram. What is the cost of 3 kg of grass seed?

The rate is \$4/kg
four dollars per kilogram

1 kg costs \$4.
3 kg cost $3 \times \$4 = \12 .



EXERCISES

Write the rate using symbols.

- \$25 per hour \$25/h
- \$7.35 per kilogram \$7.35/kg
- \$1.29 per metre \$1.29/m
- \$0.45 per litre \$0.45/L
- \$18 per square metre \$18/m²
- \$500 per week \$500/wk

Find the cost.

- 4 boxes at \$4.50 per box \$18
- 6 cans at \$3.95 per can \$23.70
- 18 m at 65¢/m \$11.70
- 8 L at \$0.85/L \$6.80
- 100 m² at \$25/m² \$2500
- 5 h at \$2.50/h \$12.50

Find the cost of one.

- 3 kg for \$9 \$3 each
- 3 cans for 87¢ \$0.29 each
- \$32 for 8 h work \$4.00/h
- 4 for \$4 \$1.00 each
- 3 boxes for \$3.30 \$1.10/box
- 36 m² for \$720 \$20/m²
- 6 cases cost \$88.50 \$14.75/case
- 8 t cost \$2200 \$275/t

Copy and complete the table.

21.

Litres of ice cream	1	2	3	4	5
Cost in dollars	\$1.95				

\$3.90 \$5.85 \$7.80 \$9.75

194

Using the Exercises

- For questions 1 to 6 see that the students use the correct abbreviations as they translate the rate statements into symbol form.
- Questions 7 to 12 require the students to find the cost of a number of units given the unit price.
- Questions 13 to 20 require students to find the unit price. See that they record the unit prices using symbols.
- Question 21 requires the students to fill in a price-rate table.

PRACTICE

Copy and complete the table.

1. Number of people	1	2	3	4	5	6
Cost of movie tickets	\$5.25					

10.50 15.75 21.00 26.25 31.50

Find the cost.

2. 6 kg at \$5.20/kg **\$31.20** 3. 5 cans at 35¢/can **\$1.75**
 4. 7 m at \$1.99/m **\$13.93** 5. 8 h at \$6.50/h **\$52.00**

Find the cost of one.

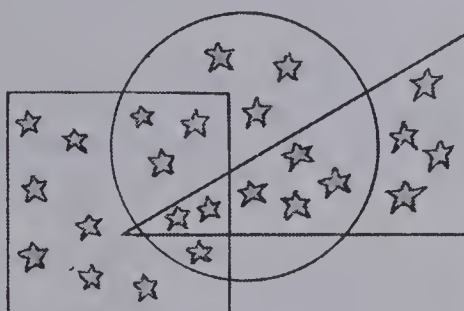
6. 8 cartons for \$56.64 **\$7.08** 7. 24 L for \$10.80 **\$0.45**
 8. 6 m³ for \$216 **\$36** 9. 8 h work for \$72 **\$9/h**

Solve.

10. If 6 bags of nails cost \$3.60, how much does one bag cost? **\$0.60**
 11. If one card costs \$0.65, how much do 6 cards cost? **\$3.90**
 12. If 3 m of carpet cost \$12, how much does 1 m cost? **\$4.00**
 13. If 24 cans of beans cost \$4.95, how much do 48 cans cost? **\$9.90**
 14. If 4 bars of soap cost \$1.20, how much do 8 bars cost? **\$2.40**
 15. If 12 boxes of apples cost \$36, how much do 6 boxes cost? **\$18.00**

Star Gazer

1. How many stars are in **Circle**, but not in **Rectangle** or **Triangle**? **3**
 2. How many stars are in **Rectangle**, but not in **Circle** or **Triangle**? **7**
 3. How many stars are in both **Circle** and **Triangle**, but not in **Rectangle**? **4**
 4. How many stars are in **Circle** and **Rectangle**? **2**



195

Assigning the Practice

Minimum: 1-10

Average: 1-12

Enriched: 4-15

Reinforcement

1. Place newspaper ads and questions similar to the following on cards for the students to solve.

Cost of gas: 48.8¢/L.
What is the cost of 50 L?

Cost of tennis balls:
3 for \$5.95.
What is the cost of one ball?

Cost of cheese: \$4.79/kg.
What is the cost of 3 kg?

Encourage the students to look for similar ads and then place them on cards with a question for the others to solve.

2. Ask the students to make a rate table showing Pauline's salary after 5 h, 8 h, 10 h, and 12.5 h work, if she gets \$5.50/h.

Enrichment

1. Assign *Star Gazer* at the bottom of page 195.

2. Which is the better buy?

Cost of honey: 500 g/\$2.49
or 1 kg/\$4.89

Cost of beef: 4 kg/\$33.12
or 3 kg/\$25.50

Cost of pears: 3 kg/\$8.97
or 2 kg/\$6.38

3. Ask the students to make a line graph of the price-rate tables on pages 194 and 195.

Extra Practice

Worksheet A47

Pages 194-195

Find the cost.

1. 5 kg at \$0.63/kg **\$3.15** 2. 8 m at 45¢/m **\$3.60**
 3. 4 bottles at \$2.88 bottle **\$11.52** 4. 3 days at \$33/day **\$99**

Find the cost of one.

5. 5 jars for \$11.35 **\$2.27** 6. 10 h for \$75 **\$7.50**
 7. 3 g for \$39.15 **\$13.05** 8. 16 L for \$6.32 **\$0.40**

Complete the tables.

9.	Number of hamburgers	1	2	3	4	5
	Cost of hamburgers	\$1.30	\$2.60	\$3.90	\$5.20	\$6.50

Objective A48

Understand the concept of rates involving time and speed; calculate such rates from given facts.

Introducing the Lesson

Have the students complete the following tables involving these two rates.

Fast Walker

Time (h)	1	2	3
Distance (km)	6		

Jet Plane

Time (h)	1	2	3
Distance (km)	1000		

Discuss the difference in the meanings of *time*, *distance*, and *speed*.

Teaching the Lesson

Sketch the following speed signs on the chalkboard. Ask what the signs mean and where you would find them.

Speed Limit	Speed Limit	Speed Limit	Speed Limit
30 km/h	50 km/h	80 km/h	100 km/h

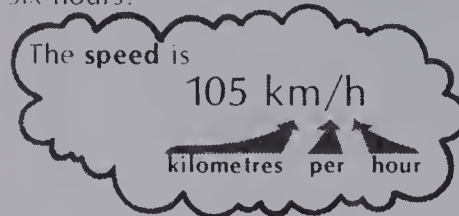
Talk about a car travelling on the highway at the *speed* of 80 km/h. Ask, "How far would the car go in 3 h at that speed?" Point out that 80×3 or 240 km would be the distance travelled in 3 h. Do other similar examples using the traffic signs. Let the students conclude that **speed \times time = distance**.

Read and discuss the lesson example on page 196. Ask, "What information is given?" *Speed and time*. "How do we find the distance travelled in 6 h?" *Multiply speed \times time*.
 $6 \times 105 = 630$ time \times speed = distance

Discuss the following problem. A man drove from his home to the airport on an expressway for 2 h for a distance of 200 km. What was his speed? See if the students realize that division is required to find the speed:
 $200 \div 2 = 100$ km/h. Try several other problems which involve finding the speed or the time. Let the students conclude: **distance \div time = speed**
distance \div speed = time

Speed

The commuter train travels at a rate of 105 kilometres **per** hour. How far could the commuter train travel in six hours?



In 1 h, the train travels 105 km.

In 6 h, it could travel 6×105 km = 630 km.



EXERCISES

Write the speed using symbols.

- 88 kilometres **per** hour *88 km/h*
- 2.5 metres **per** second *2.5 m/s*
- 565 kilometres **per** day *565 km/day*
- 40 kilometres **per** hour *40 km/h*

Find the distance travelled.

- At 70 km/h, how far does a car travel in 3 h? *210 km*
- At 8 km/h, how far does a cyclist ride in 5 h? *40 km*
- At 18 m/s, how far does a train travel in 7 s? *126 m*

Find the speed.

- 450 km in 5 h (kilometres **per** hour) *90 km/h*
- 2000 m in 8 min (metres **per** minute) *250 m/min*
- 100 m in 10 s (metres **per** second) *10 m/s*
- 750 km in 15 h (kilometres **per** hour) *50 km/h*

Copy and complete the table for an airplane travelling at a steady speed of 550 km/h.

12.

Time (h)	1	2	3	4	5	6
Distance (km)	550					

1100 1650 2200 2750 3300

Using the Exercises

- Questions 1 to 4 require the students to write the speeds using symbols.
- For questions 5 to 7, students are to find the *distance* travelled, given the speed and the time. Some students may require the formula, speed \times time = distance.
- For questions 8 to 11, students are to find the *speed* given the distance and the time. Some students may need the formula distance \div time = speed.
- Question 12 requires the students to complete a time and distance table given the speed of 550 km/h.

PRACTICE

Find the distance travelled.

- At 75 km/h, how far could a car travel in 4 h? **300 km**
- At 330 m/s, how far does sound travel in a minute? **19 800 m**
- At 30 000 000 000 cm/s, how far does light travel in a minute?
1 800 000 000 000 cm (= 18 000 000 km)

Find the speed.

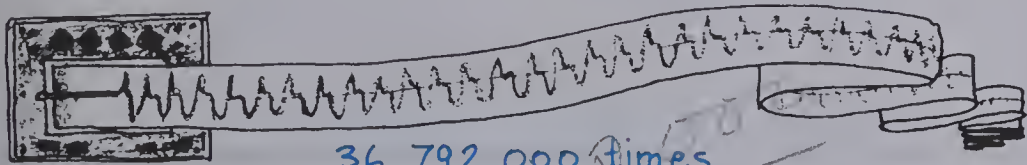
- 15 m in 3 s (metres per second) **5 m/s**
- 2500 km in 4 h (kilometres per hour) **625 km/h**
- 4 km in 2 min (kilometres per minute) **2 km/min**

Solve.

- An Olympic swimmer swam 100 m in 50 s. What was her average speed in metres per second? **2 m/s**
- A long distance runner ran 10 000 m in about 25 min.
 - What was his average speed in metres per minute? **400 m/min**
 - What was his average speed in metres per hour? **24 000 m/h**
 - What was his average speed in kilometres per hour? **24 km/h**
- Melba is making plans for a trip to Halifax. The total distance is 1830 km. Suppose she averages about 80 km/h and drives for about 8 h every day. How many days will the trip take? **Almost 3 days**
- A cross-country skier went 30 000 m in 1 h 30 min. What was his average speed in kilometres per hour? **20 000 m/h = 20 km/h**

Heart Beats

The human heart beats about 70 times per minute. How many times would it beat per year at the same rate?



197

Extra Practice

Worksheet A48

Pages 196-197

Complete the table for the cyclist travelling at an average speed of 60 km/h.

1.	Time	1 h	2 h	3 h	4 h	5 h
	Distance	60 km	120 km	180 km	240 km	300 km

Find the distance travelled.

- At 340 m/min, how far could a runner go in 5 min? **1700 m**
- At 110 km/h, how far could a car go in 3 h? **330 km**

Find the speed.

- 1956 km in 3 h (kilometres per hour) **652 km/h**
- 20 m in 5 s (metres per second) **4 m/s**
- 10 pages in 25 min (pages per minute) **0.4 page/min**

Find the time.

- At 95 km/h, how many hours would it take a car to go 475 km? **5 h**
- At 330 m/s, how many seconds would it take sound to travel 990 m? **3 s**

Assigning the Practice

Minimum: 1-8

Average: 1-10

Enriched: 1-10

Reinforcement

1. For each item in the list, have the students tell whether it represents a speed, time, or a distance.

- | | |
|------------|------------|
| a. 65 km/h | b. 72 h |
| c. 350 m | d. 5 s |
| e. 7 d | f. 600 m/s |
| g. 24 min | h. 585 km |
| i. 30 km/h | j. 89 km |

2. Ask the students to make a table showing several times for questions 1, 2, and 3 on page 197.

3. Have the students make up word problems involving speed, time, and distance for a trip they have taken. Students can then exchange problems and solve.

Enrichment

1. Assign *Heart Beats* at the bottom of page 197. Students may also be interested in showing how many times the human heart beats in one day, week, month, or year.

2. Have the students estimate the speeds at which the following animals can run or fly and then research the speeds in the encyclopedia. Display their findings.

cheetah	barracuda
race horse	dolphin
rabbit	whale
ostrich	eagle
elephant	plover

UNIT 9 LESSON 3

Objective N15

Understand the concept of ratio;
determine ratios from given facts;
interpret ratios as fractional parts and
fractional parts as ratios.

Introducing the Lesson

Discuss everyday situations in which the comparison of numbers might be used; for example, the number of boys and girls in a class, the masses of two or more students, the heights of two or more students, the amount of time spent on homework for different subjects, etc. Try to establish that such comparisons must involve measurements of the same kind and be of things which share a particular quality that may be measured. For example, the heights of two students can be compared, but the height of one cannot be compared to the mass of the other.

Teaching the Lesson

Discuss the lesson example on page 198. Then use concrete objects, such as 3 red pencils and 2 yellow pencils, and ask for the ratio of one set to the other. Ask the students to write the ratios both ways.

3 red pencils to 2 yellow pencils

3:2 or $\frac{3}{2}$

Have them read the ratios aloud. Do several more examples together, stressing the importance of the *order* of comparison. For example, the ratio of 5 girls to 7 boys is 5:7, not 7:5.

When ratios are written involving measurements or money, we often use the same units.

6 m to 75 m 600 cm to 75 cm

600:75 or $\frac{600}{75}$

\$1.50 to 50¢ → 150¢ to 50¢

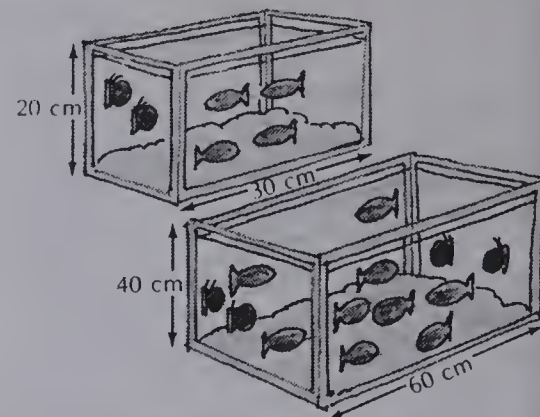
150:50 or $\frac{150}{50}$

Ratio

Ratio is a comparison of numbers.

The **ratio** of the number of fish in the small tank to the number of fish in the large tank is 4 to 9.

This is often written as 4:9 or $\frac{4}{9}$



EXERCISES

Use the above picture. Write these ratios.

1. the number of snails in the large tank to the number of snails in the small tank

4 to 2 or 4:2 or $\frac{4}{2}$

2. the height of the small tank to the height of the large tank

20 to 40 or 20:40 or $\frac{20}{40}$

3. the length of the small tank to the length of the large tank

30 to 60 or 30:60 or $\frac{30}{60}$

4. the total number of snails to the total number of fish

6:13

Write each ratio in fraction form.

5. 2 to 1

$\frac{2}{1}$

6. 1 to 2

$\frac{1}{2}$

7. 9:5

$\frac{9}{5}$

8. 5:9

$\frac{5}{9}$

9. 8:5

$\frac{8}{5}$

Write each fraction in the ratio form (■:■).

10. $\frac{2}{3}$

2:3

11. $\frac{3}{2}$

3:2

12. $\frac{4}{1}$

4:1

13. $\frac{6}{5}$

6:5

14. $\frac{4}{7}$

4:7

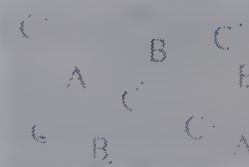
Write the ratio of

15. As to Bs 2:3

16. Bs to Cs 3:5

17. As to Cs 2:5

18. As to total number of letters 2:10



Using the Exercises

- For questions 1 and 2, an understanding of the different ways a ratio can be written is required.
- Questions 3 and 4 require that ratios be written in three ways after studying a picture.
- The students must understand the way to rewrite a ratio in either fraction or ratio form for questions 5 to 14. Also have the students say each ratio aloud to reinforce the *order* of comparison.
- Questions 15 to 18 require students to write ratios after studying a picture.

PRACTICE

Write the ratio to compare the numbers of objects.

- | | | |
|--------------------------|---------------------|-------|
| 1. M M N N M M N | Ns to Ms | 3:4 |
| 2. 1 2 2 1 2 2 1 2 2 1 1 | 1s to 2s | 5:6 |
| 3. ◇◇◇◇◇◇◇◇○○ | ◇ to ○ | 7:2 |
| 4. 12 books, 1 box | books to boxes | 12:1 |
| 5. 8 girls, 11 boys | boys to people | 11:19 |
| 6. 2 dogs, 5 cats | dogs to cats | 2:5 |
| 7. 11 bananas, 15 apples | bananas to fruit | 11:26 |
| 8. 6 cookies, 7 brownies | brownies to cookies | 7:6 |

Solve.

9. There are 23 men and 27 women in a fitness club. What is the ratio of men to women? **23:27**
10. A recipe calls for 2 L of ginger ale, and 5 L of fruit juice. What is the ratio of the amount of ginger ale to the amount of liquid? **2:7**
11. Marta wrote a math test with 20 questions. She got 17 correct answers. Write these ratios.
 - a. correct answers to test questions **17:20**
 - b. wrong answers to test questions **3:20**
 - c. wrong answers to correct answers **3:17**

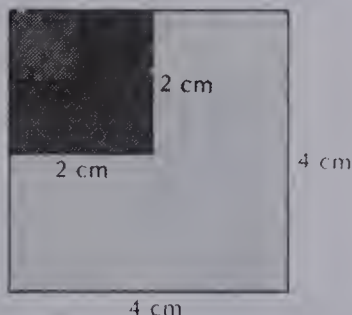
Area Ratios

We can show comparisons of *three* numbers in ratio form. The ratio of the lengths of the sides of the squares is:

4:2:1 or 4 to 2 to 1.

What is the ratio of the areas of the three squares?

16:4:1



199

Assigning the Practice

Minimum: 1-10

Average: 1-11

Enriched: 1-11

Reinforcement

1. Assign *Area Ratios* at the bottom of page 199.

2. Have the students devise these ratios. Number of:

- a. girls to boys in the class.
- b. boys to students in the class.
- c. right-handed to left-handed students in the class.
- d. teachers to students in the class.
- e. students wearing glasses to students not wearing glasses.

3. Ask the students to look around at various classroom objects and make up two ratio questions about them. These questions can then be exchanged to be recorded in both ratio and fraction form.

Enrichment

Tell the students that ratios in fraction form are often written in the simplest terms; for example, the ratio of 150¢ to 50¢ is written 3 to 2. Ask the students to write these ratios in simplest terms.

- a. 100 points to 10 points
- b. \$75 to \$25
- c. 45 people to 9 cars
- d. 200 children to 5 buses
- e. 24 children to 6 grownups
- f. 4 good buys to 12 bad buys
- g. 15 days of work to 6 days off
- h. 30 students in 5 rows

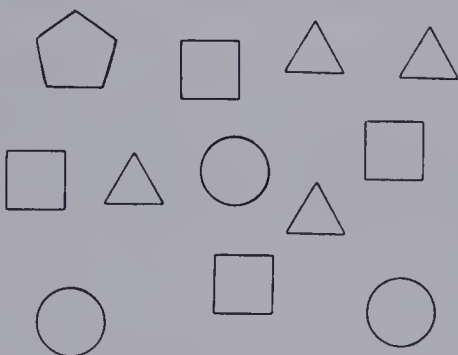
Extra Practice

Write the ratio to compare the numbers of objects.

1. squares to triangles **4:4**
2. triangles to circles **4:3**
3. pentagons to circles **1:3**
4. pentagons to squares **1:4**
5. squares to pentagons **4:1**
6. circles to squares **3:4**

Solve.

7. In a class election, Jerry got 12 votes and Sandra got 16. What was the ratio of votes for Sandra to votes for Jerry? **16:12**
8. In last summer's baseball season, Lou had 10 home runs, Ingrid had 8, and Claude had 7. Write these ratios:
 - a. Lou's home runs to Ingrid's **10:8**
 - b. Claude's home runs to Lou's **7:10**
 - c. Ingrid's home runs to Claude's **8:7**



Worksheet N15

Pages 198-199

UNIT 9 LESSON 4

Objective N16

Understand the concept of equivalent ratios; calculate such ratios.

Introducing the Lesson

Review equivalent fractions, pages 148 and 150 of Unit 7, with these examples. Have the students recall that when the numerator and denominator of a fraction are multiplied or divided by the same number, the result is an equivalent fraction.

a. $\frac{5}{8} = \frac{5 \times 6}{8 \times 6} = \frac{30}{48}$ b. $\frac{15}{18} = \frac{15 \div 3}{18 \div 3} = \frac{5}{6}$
 c. $\frac{3}{4} = \frac{3}{28}$ d. $\frac{14}{28} = \frac{1}{2}$
 e. $\frac{6}{7} = \frac{30}{49}$ f. $\frac{11}{4} = \frac{11}{44}$

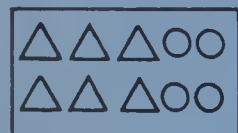
Teaching the Lesson

Model the following ratios on an overhead projector. Discuss how equivalent ratios are generated.



3 ▲s to 2 ●s
 3:2 or $\frac{3}{2}$

Double each set.



3:2 = 6:4
 or
 $\frac{3}{2} = \frac{3 \times 2}{2 \times 2} = \frac{6}{4}$

Read and discuss the generation of equivalent ratios at the top of page 200. Model the situations with concrete materials. Let the students discover that equivalent ratios are generated in the same way as equivalent fractions.

Discuss everyday situations in which equivalent ratios are used to solve problems.

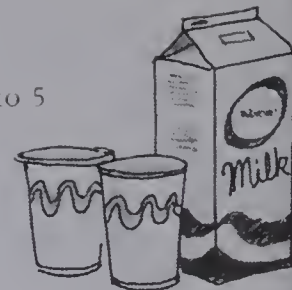
- We can modify a recipe that serves 6 people so that it will serve 2 people.
- We can mix gas and oil in the proper amounts for motorboat engines.
- We can modify card games for 2 people to games for 4 people.

Equivalent Ratios

In planning a neighbourhood picnic, Mr Albright decided to take 2 L of milk for every 5 children

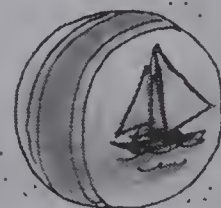
The ratio of litres of milk to the number of children is 2 to 5

2 L for 5 children $\frac{2}{5} \times 2 = \frac{4}{10}$
 4 L for 10 children $\frac{4}{10} \div 2 = \frac{2}{5}$
 8 L for 20 children $\frac{8}{20} \div 2 = \frac{4}{10}$



He also planned to bring 6 beach balls for 10 children

6 balls for 10 children $\frac{6}{10} \div 2 = \frac{3}{5}$
 3 balls for 5 children $\frac{3}{5} \times 2 = \frac{6}{10}$



Two equivalent ratios make a proportion

$2:5 = 4:10$ $6:10 = 3:5$
 $\frac{2}{5} = \frac{4}{10}$ $\frac{6}{10} = \frac{3}{5}$

EXERCISES

Write a pair of ratios for each picture

1.



10:5
 2:1

2.



6:8
 3:4

3.



14:7
 2:1

Find the value for N

4. $\frac{4}{3} = \frac{8}{N}$ 6 5. $\frac{1}{2} = \frac{N}{6}$ 3 6. $\frac{2}{5} = \frac{N}{20}$ 8 7. $\frac{1}{7} = \frac{3}{N}$ 21
 8. $\frac{5}{6} = \frac{10}{N}$ 12 9. $\frac{3}{8} = \frac{N}{48}$ 18 10. $\frac{11}{12} = \frac{N}{24}$ 22 11. $\frac{1}{4} = \frac{5}{N}$ 20
 12. $\frac{N}{5} = \frac{10}{50}$ 1 13. $\frac{1}{6N} = \frac{2}{12}$ 6 14. $\frac{3N}{4} = \frac{12}{16}$ 3 15. $\frac{9}{10N} = \frac{27}{30}$ 10
 16. $\frac{7}{N8} = \frac{21}{24}$ 8 17. $\frac{2N}{3} = \frac{8}{12}$ 2 18. $\frac{5}{9N} = \frac{15}{27}$ 9 19. $\frac{6}{18N} = \frac{1}{3}$ 18

Using the Exercises

- Questions 1 to 3 should be done orally. Point out division as one means of generating equivalent ratios.
- For questions 4 to 19, the students must look for either two given numerators or denominators; decide on their relationship (multiplication or division); and then use the same relationship to determine the value for N.

Complete the proportion.

1. $\frac{5}{6} = \frac{15}{N}$ 18
2. $\frac{3}{N} = \frac{21}{28}$ 4
3. $\frac{1}{2} = \frac{N}{14}$ 7
4. $\frac{5N}{8} = \frac{25}{40}$
5. $\frac{1}{N} = \frac{12}{48}$ 4
6. $\frac{3}{5} = \frac{18}{N}$ 30
7. $\frac{7}{N} = \frac{21}{27}$ 9
8. $\frac{2}{3} = \frac{N}{9}$ 6
9. $\frac{7N}{10} = \frac{35}{50}$
10. $\frac{5}{N} = \frac{55}{99}$ 9
11. $\frac{6}{7} = \frac{30}{N}$ 35
12. $\frac{5}{48} = \frac{10}{N}$ 96

Write "yes" if the ratios are equivalent and "no" if they are not

13. 2:3, 9:12 No
14. 5:9, 15:18 No
15. 6:10, 12:20 Yes
16. 4:5, 12:20 No
17. 3:8, 12:32 Yes
18. 3:4, 9:20 No
19. 11:12, 33:36 Yes
20. 1:6, 7:48 No

Find the value of N

21. $8:15 = 16:N$ 30
22. $8:N = 16:24$ 12
23. $9:35 = N:70$ 18
24. $N:5 = 3:15$
25. $9:5 = N:20$ 36
26. $3:2 = 15:N$ 10

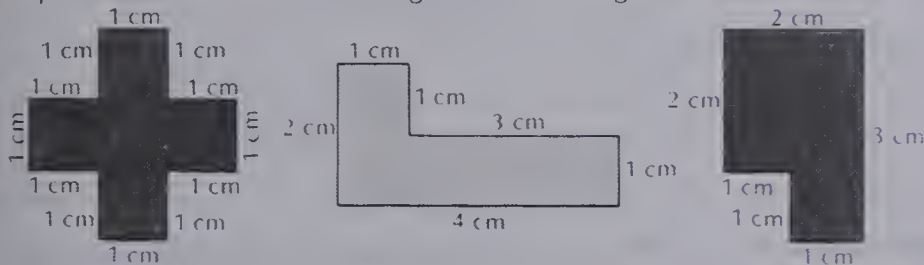
Apples are selling for 2 for 25¢

27. How many can you buy for 50¢? 4
28. What is the cost of 12 apples? 6
29. What is the cost of one apple? 8

Proportional Drawings

Draw an enlargement of each figure using grid paper
Make the sides 3 times longer

Compare the areas of the new figures to the originals.



201

Assigning the Practice

Minimum: 1-12, 21-26

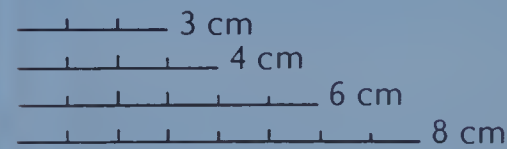
Average: 5-29

Enriched: 5-29

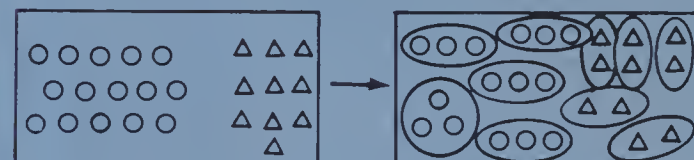
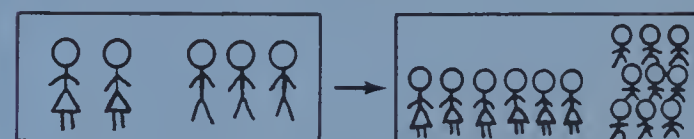
Reinforcement

1. Have the students model pairs of equivalent ratios using line segments in even centimetres.

3:4 = 6:8



2. Ask the students to write a pair of equivalent ratios from the following kinds of pictorial examples.



Enrichment

1. Assign *Proportional Drawings* at the bottom of page 201.

2. Photocopy several recipes. Glue them to cards and ask the students to either increase or decrease the given number of servings. Some students might be interested in preparing the food suggested in the recipe and sharing it with the class.

Extra Practice

Worksheet N16

Pages 200-201

Complete the proportion.

1. $\frac{2}{3} = \frac{10}{15}$
2. $\frac{2}{3} = \frac{24}{36}$
3. $\frac{1}{5} = \frac{5}{25}$
4. $\frac{1}{5} = \frac{4}{20}$
5. $\frac{2}{5} = \frac{6}{15}$
6. $\frac{3}{8} = \frac{9}{24}$
7. $\frac{1}{10} = \frac{3}{30}$
8. $\frac{1}{12} = \frac{3}{36}$
9. $\frac{40}{4} = \frac{10}{1}$
10. $\frac{2}{9} = \frac{6}{27}$
11. $\frac{3}{5} = \frac{12}{20}$
12. $\frac{15}{18} = \frac{5}{6}$

Find the value of N .

13. $9:3 = 3:N$ 1
14. $4:10 = N:5$ 2
15. $100:25 = 4:N$ 1
16. $N:25 = 5:1$ 125
17. $200:N = 4:1$ 50
18. $7:2 = 49:N$ 14

Objective PS9

Use proportion as a strategy in problems involving multiplication and division.

Introducing the Lesson

Write the following statements on the chalkboard. Have the students complete them and discuss their meaning.

$$1:4 = 4:\blacksquare \quad \frac{2}{3} = \frac{4}{\blacksquare} \quad 2:5 = 6:\blacksquare$$

Point out that two equivalent ratios are also called a **proportion**.

Teaching the Lesson

Read and discuss the problem at the top of page 202. Explain the steps in using a proportion as the strategy for solving the problem.

a. Let the cost of 10 shrubs be represented by N .

b. Set up the proportion. $\frac{2}{29} = \frac{10}{N}$

Explain that the number of shrubs is always in the numerator and the cost of the shrubs is always in the denominator.

c. Find the value of N .

$$\frac{2}{29} = \frac{2 \times 5}{29 \times 5} = \frac{10}{145}$$

$$N = \$145$$

10 shrubs cost \$145.

Give the students several other problems in which a proportion strategy can be used for the solution. Work them orally.

A recipe uses 2 eggs for 12 muffins. How many eggs would be needed for 36 muffins?

a. Let the number of eggs for 36 muffins be N .

b. Set up the proportion. $\frac{2}{12} = \frac{N}{36}$

Point out how the number of eggs is always in the numerator and the number of muffins is always in the denominator.

c. Find the value of N .

$$\frac{2}{12} = \frac{2 \times 3}{12 \times 3} = \frac{6}{36}$$

$$N = 6$$

6 eggs are needed for 36 muffins.

Proportion Problems

The sale price of shrubs is 2 for \$29.

What will be the cost of 10 shrubs?

Write a proportion to solve the problem.

Suppose that 10 shrubs cost \$ N

$$\frac{2}{29} = \frac{10}{N} \quad \frac{2}{29} \times 5 = \frac{10}{145}$$

$$\text{So, } N = 145.$$

Ten shrubs cost \$145.



EXERCISES

Use a proportion to find the value of N .

1. Bob bicycled 17 km in 2 h.

At the same rate, he could travel N km in 6 h.

$$\frac{17}{2} = \frac{N}{6} \quad 51$$

2. Four bottles of syrup cost \$5.

N bottles cost \$15.

$$\frac{4}{5} = \frac{N}{15} \quad 12$$

3. Janet can run 50 m in 9 s.

At the same rate, she would run 100 m in N s.

$$\frac{50}{9} = \frac{100}{N} \quad 18$$

Write a proportion.

4. John made \$18 in 5 h.

He could make \$ N in 20 h.

$$\frac{18}{5} = \frac{N}{20} \quad N = \$72$$

5. Alicia drove 230 km in 2 h.

She could drive N km in 6 h.

$$\frac{230}{2} = \frac{N}{6} \quad N = 690 \text{ km}$$

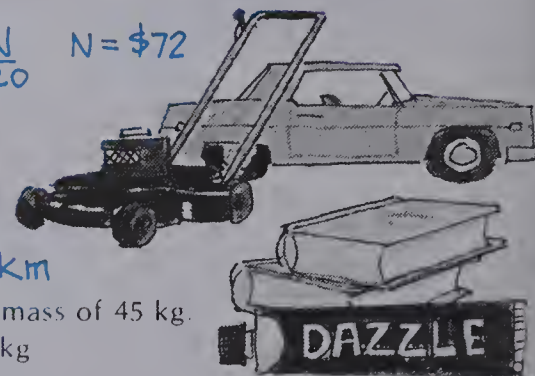
6. Two cartons of books have a mass of 45 kg.

Six cartons have a mass of N kg

$$\frac{2}{45} = \frac{6}{N} \quad N = 135 \text{ kg}$$

7. Three tubes of toothpaste cost \$4. Nine tubes cost \$ N .

$$\frac{3}{4} = \frac{9}{N} \quad N = \$12$$



Using the Exercises

- Do questions 1 to 3 orally. Show how the given proportion helps solve the problem. Point out how the numerators are one kind of item and the denominators are another kind.

$$\frac{\text{kilometres}}{\text{hours}} \quad \frac{17}{2} = \frac{N}{6}$$

$$\frac{\text{numbers of bottles}}{\text{cost of bottles}} \quad \frac{4}{5} = \frac{N}{15}$$

- Questions 4 to 7 require the students to solve problems using the proportion strategy. Provide additional help to any student experiencing difficulty in setting up the correct proportion.

PRACTICE

Use proportions to solve these problems.

1. Janice earns \$22 in 4 h. How much would she earn in 12 h at that rate of pay? **\$66**
2. An assembly line can produce 125 radios in 3 h. How long will it take to produce 625 radios at the same rate of production? **15 h**
3. 5 m of electric cable cost \$2.84. What is the cost of 15 m? **\$8.52**
4. On a map, 1 cm represents 25 km. What is the real distance between two cities that are 5 cm apart on the map? **125 km**
5. A recipe that serves 4 people requires 3 eggs. How many eggs are needed if the recipe is to serve 12 people? **9 eggs**

REVIEW

Copy and complete the table.

A47	1. Number of pizzas	1	2	3	4	5
	Cost in dollars	\$5.50	\$11.00	\$16.50	\$22.00	\$27.50

Find the speed.

2. 200 m in 4 min (metres per minute) **50 m/min**
3. 38 km in 2 h (kilometres per hour) **19 km/h**
4. 1500 km in 2 d (kilometres per day) **750 km/d**

Write the ratio three ways. **3 to 1** **2 to 7** **2:7** **$\frac{2}{7}$**

5. 3 books for each student **3:1**
6. 2 telephones for 7 people **$\frac{16}{7}$**
7. 2 tea bags in each tea pot **$\frac{3}{1}$**
8. 16 boys to 18 girls **16 to 18** **16:18**

Find the value for N.

9. $\frac{5}{6} = \frac{N}{30}$ **25**
10. $\frac{15}{17} = \frac{30}{N}$ **34**
11. $\frac{N}{8} = \frac{12}{32}$
12. $\frac{11}{12N} = \frac{33}{36}$

203

Assigning the Practice

Minimum: 1-5

Average: 1-5

Enriched: 1-5

Review Exercises

Questions	Objective	Pages
1	A47	194-195
2-4	A48	196-197
5-8	N15	198-199
9-12	N16	200-201

Reinforcement

1. Attach newspaper or catalog ads to stiff cards and write a word problem that would use a proportion strategy for each ad. Have the students solve the problems individually or as part of a team game.

Two candy bars cost 60¢.
How much do eight candy bars cost?

Five nights in a resort hotel cost \$399.
How much do fifteen nights cost?

A box of fifteen tulip bulbs costs \$2.95.
How much would 150 tulip bulbs cost?

2. For students having difficulty writing the proportion after reading the word problem, list the three steps for them to follow and "walk them through the steps". For example, in the first problem above (Reinforcement activity 1):

a. What is N?

Let the cost of 8 candy bars be N.

b. Set up the proportion.

$$\frac{\text{number of candy bars}}{\text{cost of candy bars}} = \frac{2}{60} = \frac{8}{N}$$

c. Find the value of N.

$$\frac{2}{60} = \frac{2 \times 4}{60 \times 4} = \frac{8}{240}$$

$$N = \$2.40$$

8 candy bars cost \$2.40.

Enrichment

Have the students illustrate and then solve this problem using the proportion strategy.

A man who is 2 m tall has a 6 m shadow. A nearby telephone pole has a 48 m shadow. How high is the telephone pole?

Hint: $\frac{\text{height of man/pole}}{\text{length of shadow}}$

Extra Practice

Worksheet PS9

Pages 202-203

Use proportions to solve these problems.

1. Marta bicycled 5 km in 29 minutes. If she keeps up the same rate, how long will it take her to bicycle 10 km? **58 min**
2. A factory can make 1000 pairs of shoes in 3 days. How many shoes can they make in 12 days? **4000**
3. If 2 bottles of shampoo cost \$5.16, how much will 6 bottles cost? **\$15.48**
4. Pete earns \$54 for 12 h work. How much does he earn an hour? **\$4.50/h**
5. A recipe that serves 6 people requires 50 g of butter. How much butter is needed if the recipe is increased to serve 18 people? **150 g**

Objective N17

Understand the concept of percent;
determine percents from given facts.

Introducing the Lesson

Have ready 10 by 10 grids, 10 by 10 dot arrays, and a set of 100 Centicubes. Each of these kinds of materials should be used in these overhead projector displays.

a. Show a 10 by 10 grid with 15 squares shaded.

b. Show a 10 by 10 dot array with 32 dots circled.

c. Show a set of 100 Centicubes with 7 cubes separated from the rest.

For each of the above situations, ask the students to name and record the fraction and decimal that represents the part that is shaded, circled, or separated from the rest.

$$\frac{15}{100}, 0.15 \quad \frac{32}{100}, 0.32 \quad \frac{7}{100}, 0.07$$

Explain that these fractional parts can also be expressed as percents: 15%, 32%, or 7%. Point out that **percent** means **per hundred**.

Model several other parts of a hundred and ask the students to name the part in fraction, decimal, and percent form.

Teaching the Lesson

Read and discuss the top of page 204. Model 1%, 100%, and 200% with the above materials. Use several 10 by 10 grids to model percents greater than 100, e.g., 145%, 260%, and 450%.

Give the students a worksheet of several 10×10 grids or dot arrays. Ask them to illustrate several percents on their worksheets. Discuss some everyday situations in which the amount per hundred is used.

a. A test has 100 questions. John answered 92 correctly. What percent of the test questions did he have correct? wrong?

b. If 7¢ for each \$1.00 spent must be paid as taxes, what is the tax rate expressed as a percent?

Percent



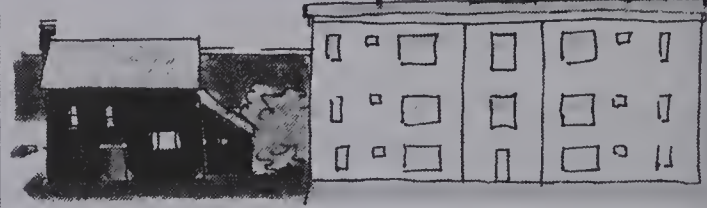
In Tom's town, 32 out of every 100 people live in houses.

$\frac{32}{100}$ or 0.32 of the people live in houses.

Often this is expressed as **thirty-two percent** or 32%.

Percent means "per hundred".

$$\begin{aligned} 1\% & \text{ is } \frac{1}{100} \text{ or } 0.01 \\ 100\% & \text{ is } \frac{100}{100} \text{ or } 1 \\ 200\% & \text{ is } \frac{200}{100} \text{ or } 2 \end{aligned}$$



EXERCISES

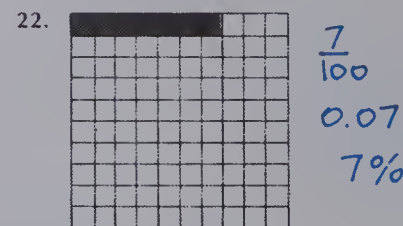
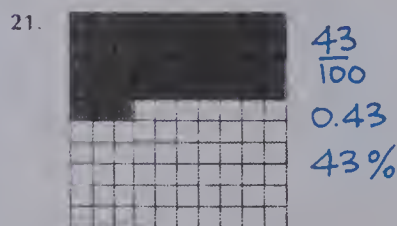
Write the fraction in decimal and percent form.

$$\begin{aligned} 1. \quad \frac{6}{100} & \quad 0.06 \quad 6\% \quad 2. \quad \frac{7}{100} \quad 0.07 \quad 7\% \quad 3. \quad \frac{50}{100} \quad 0.50 \quad 50\% \quad 4. \quad \frac{38}{100} \quad 0.38 \quad 38\% \quad 5. \quad \frac{75}{100} \quad 0.75 \quad 75\% \\ 6. \quad \frac{100}{100} & \quad 1.00 \quad 100\% \quad 7. \quad \frac{150}{100} \quad 1.50 \quad 150\% \quad 8. \quad \frac{500}{100} \quad 5.00 \quad 500\% \quad 9. \quad \frac{493}{100} \quad 4.93 \quad 493\% \quad 10. \quad \frac{115}{100} \quad 1.15 \quad 115\% \end{aligned}$$

Write in percent form.

$$\begin{aligned} 11. \quad 0.01 & \quad 1\% \quad 12. \quad 0.02 \quad 2\% \quad 13. \quad 0.05 \quad 5\% \quad 14. \quad 0.09 \quad 9\% \quad 15. \quad 0.10 \quad 10\% \\ 16. \quad 0.20 & \quad 20\% \quad 17. \quad 0.25 \quad 25\% \quad 18. \quad 0.59 \quad 59\% \quad 19. \quad 1.00 \quad 100\% \quad 20. \quad 1.59 \quad 159\% \end{aligned}$$

Write the fraction, decimal, and the percent for the shaded part.



Using the Exercises

- Questions 1 to 10 require the students to write the decimal and percent from a fraction in hundredths. Stress the meaning of percent, e.g., $\frac{6}{100}$ means 6 per hundred or 6%; $\frac{50}{100}$ means 50 per hundred or 50%.
- Questions 11 to 20 require the students to write a percent from a decimal in hundredths. Have the students say for each, *0.01 is one hundredth, or one per hundred, or 1%.*
- Questions 21 and 22 require the students to name the fraction, decimal, and percent that is illustrated.

What percent is:

- 45 m of 100 m? **45%**
- 10¢ of \$1.00? **10%**
- 95 km of 100 km? **95%**
- 7¢ of \$1.00? **7%**
- 4 cm of 1 m? **4%**
- \$1.09 of \$1.00? **109%**

Copy and complete.

- $\frac{27}{100} = \frac{27}{100} \%$
- $\frac{9}{100} = \frac{9}{100} \%$
- $\frac{2}{100} = 2\%$
- $\frac{50}{100} = 50\%$
- $\frac{185}{100} = 185\%$
- $\frac{225}{100} = 225\%$
- $0.63 = \frac{63}{100} \%$
- $0.85 = \frac{85}{100} \%$
- $0.05 = \frac{5}{100} \%$
- $1.35 = \frac{135}{100} \%$
- $0.005 = \frac{0.5}{100} \%$
- $0.125 = \frac{12.5}{100} \%$

Use <, =, or >

- $26\% \bullet \frac{26}{100}$
- $8\% \bullet \frac{80}{100}$
- $\frac{73}{100} \bullet 37\%$
- $100\% \bullet \frac{98}{100}$
- $110\% \bullet 1.10$
- $2\% \bullet 2.00$
- $\frac{10}{100} \bullet 1\%$
- $\frac{100}{100} \bullet 100\%$
- $\frac{1}{100} \bullet 0.05\%$

- The federal government collects 15% sales tax on most goods. How much do they collect from every \$100 worth of goods sold? **15¢**
- On an assembly line, 2% of the transistors are found to be defective. How many of every 100 products are defective? **2**

Consumer Problem

Bela gets \$68 take-home pay for every \$100 she earns.

- What percent of her earnings does her employer keep for taxes and other deductions? **32%**
- Taxes take up 25% of her pay. How much extra is deducted from every \$100 of Bela's pay? **\$7**

205

Assigning the Practice

Minimum: 1-24

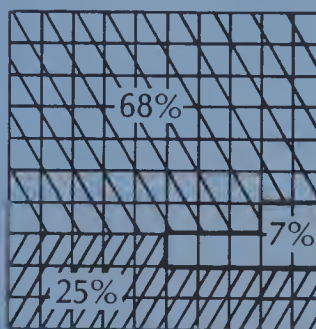
Average: 1-29

Enriched: 1-29

Reinforcement

- Assign *Consumer Problem* at the bottom of page 205. Have the students shade a 10 by 10 grid in different colours to illustrate the problem.

\$100 Earned



68% Bela gets.
25% Taxes
+ 7% Extra
100% deductions

- Provide 10 by 10 grids or dot arrays for the students to illustrate various percents.
- Have the students draw one metre line segments on the chalkboard and mark the 100 cm. Then ask them to take coloured chalk and draw line segments above the 1 m line that are 45%, 19%, 77%, 4%, and 92% as long.

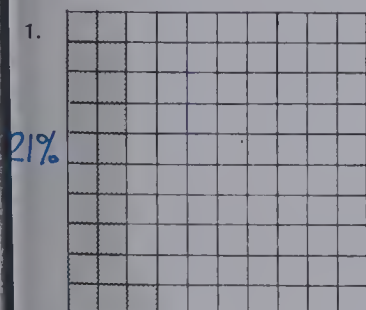
Enrichment

Ask the students to find out the interest rate on a savings account at the local bank. Then have them use that rate to complete the following chart.

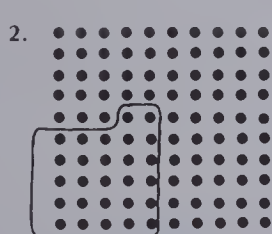
Money invested	Interest after 1 year
\$100	
\$200	
\$300	
\$500	
\$1000	
\$10 000	
\$100 000	
\$1 000 000	

Extra Practice

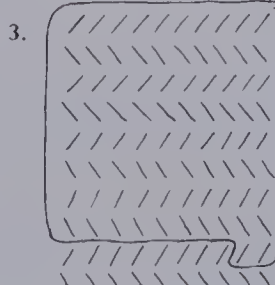
Write the circled or shaded part in percent form.



21%



27%



82%

Write in percent form

- $\frac{5}{100}$ **5%**
- $\frac{72}{100}$ **72%**
- $\frac{37}{100}$ **37%**
- $\frac{100}{100}$ **100%**
- $\frac{535}{100}$ **535%**
- 0.02 **2%**
- 0.15 **15%**
- 0.86 **86%**
- 2.62 **262%**
- 1.00 **100%**
- 3 m of a 100 m fence painted **3%**
- 65 km of a 100 km distance driven **65%**
- 5¢ of each \$1.00 earned is saved **5%**
- \$98 of a \$100 paycheck for food **98%**

Worksheet N17

Pages 204-205

UNIT 9 LESSON 7

Objective N18

Express fractions as percents.

Introducing the Lesson

Review the way equivalent fractions are generated. Stress the writing of equivalents with a denominator of 100. Have the students try these examples.


$$\frac{1}{2} = \frac{\blacksquare}{100} \quad \frac{2}{5} = \frac{\blacksquare}{100}$$


$$\frac{3}{4} = \frac{\blacksquare}{100} \quad \frac{4}{25} = \frac{\blacksquare}{100}$$

Have the students name and write the decimal equivalent for 0.50, 0.40, 0.75, and 0.16.

Teaching the Lesson

Sketch the following fractional-parts diagrams on the chalkboard. Students should name the fractional parts shaded in each. Explain that the shaded part can also be expressed as a percent, but in order to do so, the fraction must be in hundredths because percent means *per hundred*. Then have the students write a fraction equivalent in hundredths and the percent for each.

a.  $\frac{1}{4} = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = 25\%$

b.  $\frac{3}{5} = \frac{3 \times 20}{5 \times 20} = \frac{60}{100} = 60\%$

Try several other similar examples.

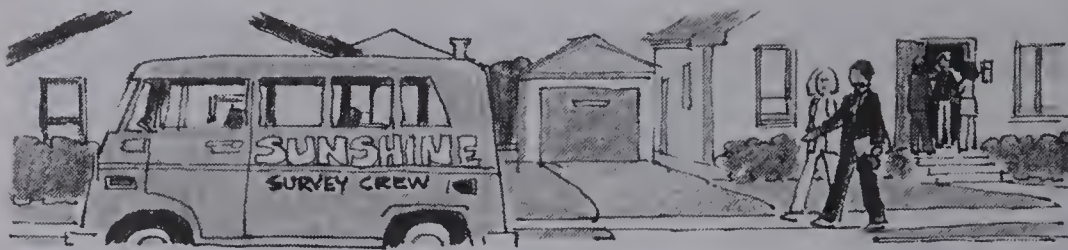
Have the students name the decimal equivalent as well, e.g., 0.25 or 0.60.

Read and discuss the top of page 206. Point out that changing the fractions to percents makes them easier to compare.

Choose sets of 2, 4, 5, 10, 20, or 25 students. Have them come to the front of the room (or stand). Ask the class to answer such questions as, "What percent of the set of students is boys? red-haired? wears glasses? is wearing jeans?"

Point out the number of questions on a recent test. Have the students determine the percent correct for various numbers of correct answers.

Fractions and Percents



A recent survey reported that $\frac{1}{4}$ of all households use "Zed" detergent.

$\frac{2}{5}$ of all households use "Sunshine" detergent.

Val converted these fractions into percents to compare the figures.

$$\frac{1}{4} \begin{matrix} \times 25 \\ \times 25 \end{matrix} = \frac{25}{100} = 25\%$$

$$\frac{2}{5} \begin{matrix} \times 20 \\ \times 20 \end{matrix} = \frac{40}{100} = 40\%$$

The results clearly show that "Sunshine" is more popular.

EXERCISES




Copy and complete.

1. $\frac{1}{4} = \frac{\blacksquare 25}{100}$ 2. $\frac{2}{4} = \frac{\blacksquare 50}{100}$ 3. $\frac{3}{4} = \frac{\blacksquare 75}{100}$ 4. $\frac{4}{4} = \frac{\blacksquare 100}{100}$

Write the equivalent percent.

5. $\frac{1}{5}$ 20% 6. $\frac{2}{5}$ 40% 7. $\frac{3}{5}$ 60% 8. $\frac{4}{5}$ 80% 9. $\frac{5}{5}$ 100%
10. $\frac{1}{50}$ 2% 11. $\frac{3}{25}$ 12% 12. $\frac{7}{10}$ 70% 13. $\frac{11}{20}$ 55% 14. $\frac{2}{2}$ 100%

Write the fraction, decimal, and percent for the shaded part.

15.  $\frac{1}{2}$ 0.50 50%
16.  $\frac{3}{10}$ 0.30 30%
17.  $\frac{13}{20}$ 0.65, 65%

Write the fraction, decimal, and percent.

18. 9 out of 10 words correct on a Spelling test. $\frac{9}{10}$, 0.90, 90%
19. 21 out of 25 problems correct on a Math test. $\frac{21}{25}$, 0.84, 84%

Using the Exercises

- Questions 1 to 4 give the students practice with writing fraction equivalents in hundredths.
- As the students change the fractions in questions 5 to 14 to percents, have them say, e.g., *one fifth is equal to twenty per hundred or twenty percent*.
- Questions 15 to 19 require the students to write the fraction, decimal, and percent. Do questions 15 and 18 orally.

Write the equivalent percent.

1. $\frac{9}{10}$ 90% 2. $\frac{4}{5}$ 80% 3. $\frac{6}{25}$ 24% 4. $\frac{13}{20}$ 65% 5. $\frac{27}{50}$ 54%
6. $\frac{1}{20}$ 5% 7. $\frac{3}{10}$ 30% 8. $\frac{23}{25}$ 92% 9. $\frac{9}{20}$ 45% 10. $\frac{17}{50}$ 34%

What percent of each figure is shaded?

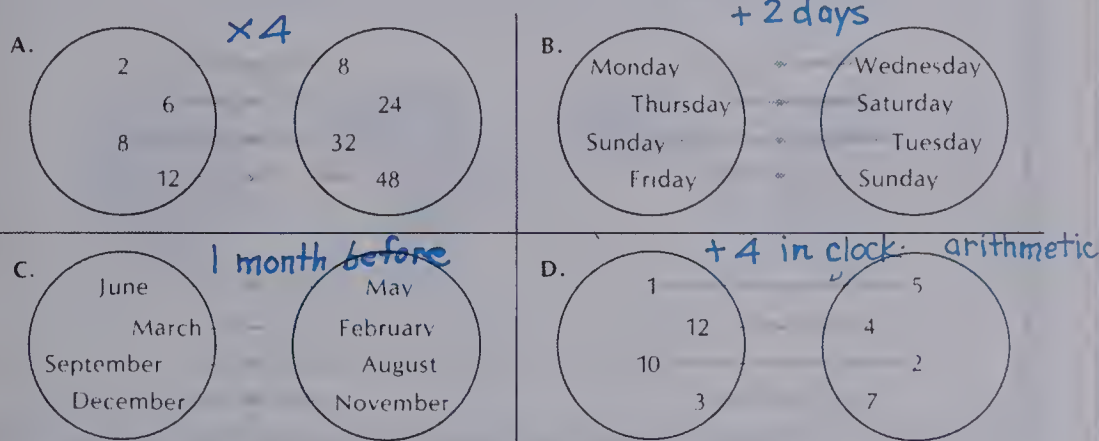


Write each test mark as a percent.

14. 19 correct out of 25 questions 76%
15. 48 correct out of 50 questions 96%
16. 11 correct out of 20 questions 55%
17. 1 correct out of 2 questions 50%
18. 4 correct out of 4 questions 100%
19. 39 correct out of 50 questions 78%
20. 24 correct out of 25 questions 96%
21. 16 correct out of 20 questions 80%

Decide the Rule

For each diagram give the rule as you follow the arrows from left to right.



207

Assigning the Practice

Minimum: 1-17

Average: 5-21

Enriched: 5-21

Reinforcement

1. Have the students make a set of flash cards showing a fraction on one side and the equivalent percent on the other side. Pairs of students can flash the cards to each other to build quick recall.

2. Ask the students to make illustrations showing the following equalities. Display their work.

- a. $\frac{1}{4} = 25$ per 100 = 25%
b. $\frac{7}{25} = 28$ per 100 = 28%
c. $\frac{3}{50} = 6$ per 100 = 6%
d. $\frac{9}{10} = 90$ per 100 = 90%
e. $\frac{18}{20} = 90$ per 100 = 90%

For example:



$\frac{1}{4} = 25$ per hundred = 25%

Enrichment

1. Assign *Decide the Rule* at the bottom of page 207.

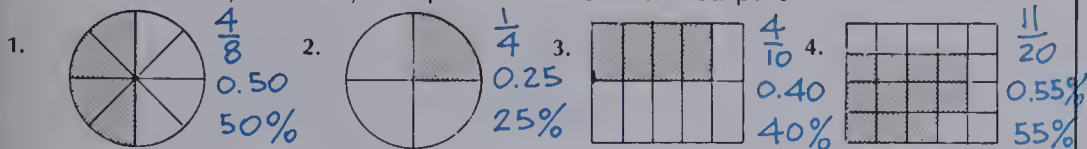
2. Have the students cut out 25 pictures of interesting or favourite animals from old magazines and attach them to a poster. Students then write information about the animals using a percent in each sentence, e.g., 36% of the animals are cold blooded. Display the posters.

Extra Practice

Worksheet N18

Pages 206-207

Write the fraction, decimal, and percent for the shaded part.



Write the equivalent percent.

5. $\frac{3}{10}$ 30% 6. $\frac{2}{5}$ 40% 7. $\frac{13}{20}$ 65% 8. $\frac{18}{25}$ 72% 9. $\frac{1}{50}$ 2%
10. $\frac{4}{20}$ 20% 11. $\frac{9}{10}$ 90% 12. $\frac{47}{50}$ 94% 13. $\frac{9}{25}$ 36% 14. $\frac{3}{5}$ 60%

Solve.

15. You are to receive some money as a gift. Would you rather have $\frac{3}{5}$ of the gift or 65%? 65% is greater $\frac{4}{25}$ is greater
16. I have some candy in a box. Would you rather have $\frac{4}{25}$ of it or 15%?

Objective N19

Express percents as fractions.

Introducing the Lesson

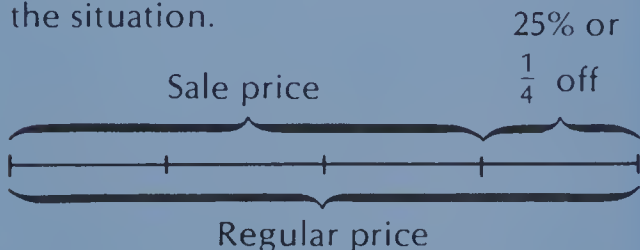
With the following examples, review the use of division for simplifying fractions and writing a fraction in simplest terms.

- a. $\frac{8}{12} = \frac{8}{12} \div \frac{4}{4} = \frac{\blacksquare}{\blacksquare}$ b. $\frac{75}{1000} = \frac{75}{1000} \div \frac{25}{25} = \frac{\blacksquare}{\blacksquare}$
 c. $\frac{12}{15} =$ d. $\frac{16}{24} =$

Have the students name which of the following fractions are expressed in simplest terms: $\frac{6}{8}, \frac{3}{7}, \frac{9}{12}, \frac{15}{18}, \frac{4}{5}, \frac{8}{28}, \frac{27}{30}$.

Teaching the Lesson

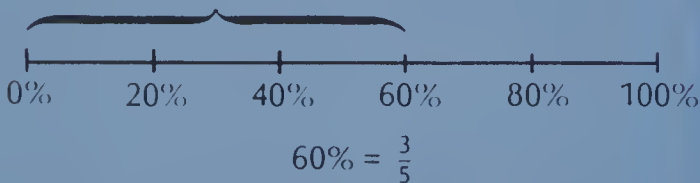
Read and discuss the problem at the top of page 208. Sketch the following diagram on the chalkboard to illustrate the situation.



After the students have visualized the problem, explain the arithmetical process for expressing a percent as a fraction.

- a. Change the percent to an equivalent fraction in hundredths. ($25\% = \frac{25}{100}$)
 b. Simplify the fraction. ($\frac{25}{100} = \frac{1}{4}$)

Show other number lines similar to the following. Ask the students to name the fraction equivalent to the percent illustrated. Show the arithmetic process too.



Stress "families" of percents and their related fraction equivalents.

100%	80%	60%	40%	20%	0%
$\frac{5}{5} = 1$	$\frac{4}{5}$	$\frac{3}{5}$	$\frac{2}{5}$	$\frac{1}{5}$	$\frac{0}{5}$

Have the students use patterns to name fraction equivalents, e.g., $100\% = 1$,

$50\% = \frac{1}{2}$, $25\% = \frac{1}{4}$, so $12\frac{1}{2}\% = ?$

Percent Equivalents

Discounts are often expressed as fractions as well as percents. A hardware dealer is reducing all her prices by 25%. How might she advertise the sale?

$$\frac{25}{100} \div \frac{25}{25} = \frac{1}{4}$$

She could advertise all prices as " $\frac{1}{4}$ off regular price"



Write in simplest terms

1. $\frac{25}{100} = \frac{1}{4}$ 2. $\frac{50}{100} = \frac{1}{2}$ 3. $\frac{75}{100} = \frac{3}{4}$ 4. $\frac{100}{100} = 1$ 5. $\frac{125}{100} = 1\frac{1}{4}$
 6. $\frac{20}{100} = \frac{1}{5}$ 7. $\frac{40}{100} = \frac{2}{5}$ 8. $\frac{60}{100} = \frac{3}{5}$ 9. $\frac{80}{100} = \frac{4}{5}$ 10. $\frac{10}{100} = \frac{1}{10}$

Write as a fraction in simplest terms.

11. $\frac{1}{4}$ 12. $\frac{1}{2}$ 13. $\frac{3}{4}$ 14. 1
 15. 10% $\frac{1}{10}$ 16. 20% $\frac{1}{5}$ 17. 30% $\frac{3}{10}$ 18. 40% $\frac{2}{5}$ 19. 50% $\frac{1}{2}$
 20. 4% $\frac{2}{50}$ 21. 8% $\frac{2}{25}$ 22. 12% $\frac{3}{25}$ 23. 16% $\frac{4}{25}$ 24. 20% $\frac{1}{5}$
 25. 15% $\frac{3}{20}$ 26. 100% $\frac{1}{1}$ 27. 2% $\frac{1}{50}$ 28. 64% $\frac{16}{25}$ 29. 95% $\frac{19}{20}$

Using the Exercises

- Questions 1 to 10 involve the second step in changing a percent to a fraction: simplifying a fraction in hundredths. See that the students are able to express all fractions in simplest terms.
- Questions 11 to 14 illustrate a fraction family. Students should be able to name the fraction merely by studying the illustrations.
- Questions 15 to 29 involve the use of the arithmetic process for writing the fraction equivalent of a percent. Note that the students may also use the patterns formed to answer questions 15 to 19 and 20 to 24.

PRACTICE

Write as a fraction in simplest terms.

1. 74% $\frac{37}{50}$
2. 4% $\frac{1}{25}$
3. 45% $\frac{9}{20}$
4. 98% $\frac{49}{50}$
5. 56% $\frac{14}{25}$
6. 80% $\frac{4}{5}$
7. 2% $\frac{1}{50}$
8. 50% $\frac{1}{2}$
9. 40% $\frac{2}{5}$
10. 5% $\frac{1}{20}$
11. 18% $\frac{9}{50}$
12. 64% $\frac{16}{25}$
13. 1% $\frac{1}{100}$
14. 48% $\frac{12}{25}$
15. 20% $\frac{1}{5}$

Copy and compare. Use $<$, $=$, or $>$.

16. 15% $<$ $\frac{4}{20}$
17. 30% $<$ $\frac{3}{5}$
18. 70% $<$ $\frac{4}{5}$
19. 75% $>$ $\frac{7}{10}$
20. 36% $=$ $\frac{9}{25}$
21. 64% $<$ $\frac{18}{25}$
22. 11% $>$ $\frac{1}{10}$
23. 55% $=$ $\frac{11}{20}$
24. 2% $<$ $\frac{2}{50}$
25. 4% $=$ $\frac{1}{25}$
26. 95% $>$ $\frac{46}{50}$
27. 92% $<$ $\frac{24}{25}$

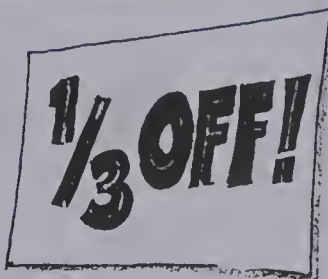
Write an equivalent fraction in simplest terms.

28. 25% = $\frac{1}{4}$
29. 5% = $\frac{1}{20}$
30. 1% = $\frac{1}{100}$
- $12\frac{1}{2}\%$ = $\frac{1}{8}$
- $2\frac{1}{2}\%$ = $\frac{1}{40}$
- $\frac{1}{2}\%$ = $\frac{1}{200}$
- $6\frac{1}{4}\%$ = $\frac{1}{16}$
- $1\frac{1}{4}\%$ = $\frac{1}{80}$
- $\frac{1}{10}\%$ = $\frac{1}{1000}$
- $3\frac{1}{8}\%$ = $\frac{1}{32}$

Special Sales

To change a fraction to a percent, find the equivalent decimal first by division.

$$\begin{array}{r} 0.333 \dots \\ 3 \overline{)1.000} \end{array} \quad \frac{1}{3} = 0.33 \text{ to the nearest hundredth.} \\ = 33\% \text{ to the nearest percent}$$



Write each fraction as a percent (to the nearest percent).

1. $\frac{2}{3}$ 67%
2. $\frac{1}{6}$ 17%
3. $\frac{5}{6}$ 83%
4. $\frac{1}{9}$ 11%
5. $\frac{2}{9}$ 22%
6. $\frac{5}{9}$ 56%

209

Assigning the Practice

Minimum: 1-24

Average: 4-27

Enriched: 16-30

Reinforcement

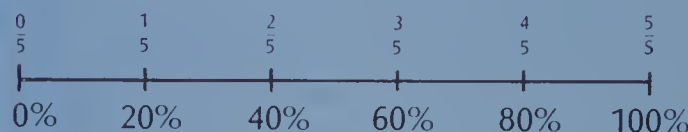
1. Give the students graph paper to make rectangular illustrations for various percent/fraction "families".

a. 50% = $\frac{1}{2}$ 100% = $\frac{2}{2}$

b. 25% = $\frac{1}{4}$ 50% = $\frac{2}{4}$

75% = $\frac{3}{4}$ 100% = $\frac{4}{4}$

2. Some students may wish to use number line illustrations of percent/fraction "families".



3. Have the students use the percent/fraction flash cards (suggested in the first Reinforcement activity of Lesson 7) with a partner.

Enrichment

1. Assign *Special Sales* at the bottom of page 209.

2. Students can shade parts of a circle to illustrate the following percents and their equivalent fractions: 100%, 50%, 15%, $12\frac{1}{2}\%$, $6\frac{1}{4}\%$, and $3\frac{1}{8}\%$.

Extra Practice

Worksheet N19

Pages 208-209

Write as a fraction in simplest terms.

1. 25% $\frac{1}{4}$
2. 30% $\frac{3}{10}$
3. 42% $\frac{21}{50}$
4. 80% $\frac{4}{5}$
5. 10% $\frac{1}{10}$
6. 95% $\frac{19}{20}$
7. 60% $\frac{3}{5}$
8. 73% $\frac{73}{100}$
9. 90% $\frac{9}{10}$
10. 96% $\frac{24}{25}$

Compare. Use $<$, $=$, or $>$.

11. 16% $>$ $\frac{4}{50}$
12. 65% $<$ $\frac{17}{20}$
13. 41% $>$ $\frac{2}{5}$
14. 3% $<$ $\frac{1}{25}$
15. 89% $<$ $\frac{9}{10}$
16. 75% $=$ $\frac{15}{20}$

Write the percent and the fraction shaded for each letter.

17. A = 40% $\frac{2}{5}$
18. B = 50% $\frac{1}{2}$
19. C = 90% $\frac{9}{10}$
20. D = 20% $\frac{1}{5}$

Objective A49

Find a percent of a number using decimals.

Introducing the Lesson

Review the meaning of *percent* as *per hundred*. 32% means 32 per hundred, 32 hundredths, or 0.32. Have the students say aloud the meanings of the following percents as they change each to a decimal: 45%, 15%, 2%, 78%, 6%, and 92%.

Lead the students to conclude that to change a percent to a decimal, the percent sign is removed and the decimal point is moved two places to the left.

Teaching the Lesson

Read and discuss the problem at the top of page 210. Ask, "What are the decimal and fraction equivalents of 7%?" After the students have named them as 0.07 and $\frac{7}{100}$ show how the problem can be solved using either equivalent. Remind the students that the word **of** means **times**.

$$\frac{7}{100} \text{ of } 300 \text{ or } \frac{7}{100} \times 300$$

$$0.07 \text{ of } 300 \text{ or } 0.07 \times 300$$

Point out that it is often easier to compute with the decimal equivalent, yet explain both calculations.

$$\frac{7}{100} \times 300 = \frac{7 \times 300}{100} = \frac{2100}{100} = 21$$

$$\begin{array}{r} \text{or} \quad 300 \\ \times 0.07 \\ \hline 21.00 \end{array}$$

Show the students a page from a sports catalog, an ad for new cars, and an ad for a new television. Have them, as a group, calculate the amount of sales tax that would be paid for several sports items, a new car, and a television. Ask them to imagine that some of the sports items in the catalog have been discounted by 20%. Have the students determine the amount of discount and sale price for each.

Percent of a Number

Ellen bought a new record player for \$300. She had to pay 7% provincial sales tax. How much tax did she pay?

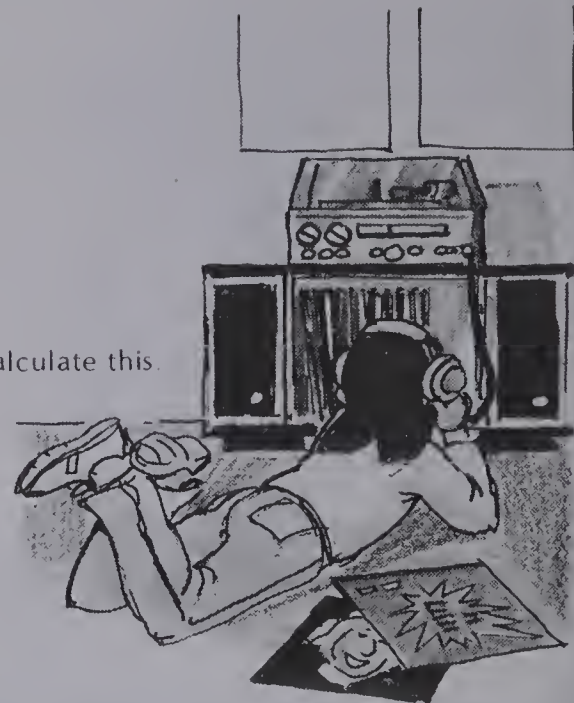
$$7\% \text{ of } \$300$$

We can use the decimal form to calculate this.

$$7\% = 0.07$$

$$0.07 \times 300 = 21$$

Ellen paid \$21 in sales tax.



EXERCISES

Calculate.

- | | | | | | |
|------------------|---------|-----------------|---------|------------------|----------|
| 1. 5% of 100 | 5 | 2. 20% of 100 | 20 | 3. 50% of 100 | 50 |
| 4. 80% of 100 | 80 | 5. 100% of 100 | 100 | 6. 250% of 100 | 250 |
| 7. 1% of 100 | 1 | 8. 1% of 50 | 0.5 | 9. 1% of 59 | 0.59 |
| 10. 10% of 100 | 10 | 11. 10% of 30 | 3 | 12. 10% of 50 | 5 |
| 13. 25% of 100 | 25 | 14. 25% of 20 | 5 | 15. 25% of 36 | 9 |
| 16. 8% of 59 | 4.72 | 17. 36% of 59 | 21.24 | 18. 75% of 59 | 44.25 |
| 19. 46% of 27 | 12.42 | 20. 78% of 18 | 14.04 | 21. 7% of 46 | 3.22 |
| 22. 10% of \$25 | \$2.50 | 23. 16% of \$50 | \$8 | 24. 5% of \$18 | \$0.90 |
| 25. 67% of \$110 | \$73.70 | 26. 38% of \$90 | \$34.20 | 27. 55% of \$250 | \$137.50 |

Using the Exercises

- Questions 1 to 15 are arranged in groups of three so that students can observe patterns to check the reasonableness of answers. For example:
 $10\% \text{ of } 100 = 10$
 $10\% \text{ of } 30 = 3$
 $10\% \text{ of } 50 = 5$
- Questions 16 to 27 require multiplication by the decimal equivalent. Note that the last six questions require a money answer.

Calculate.

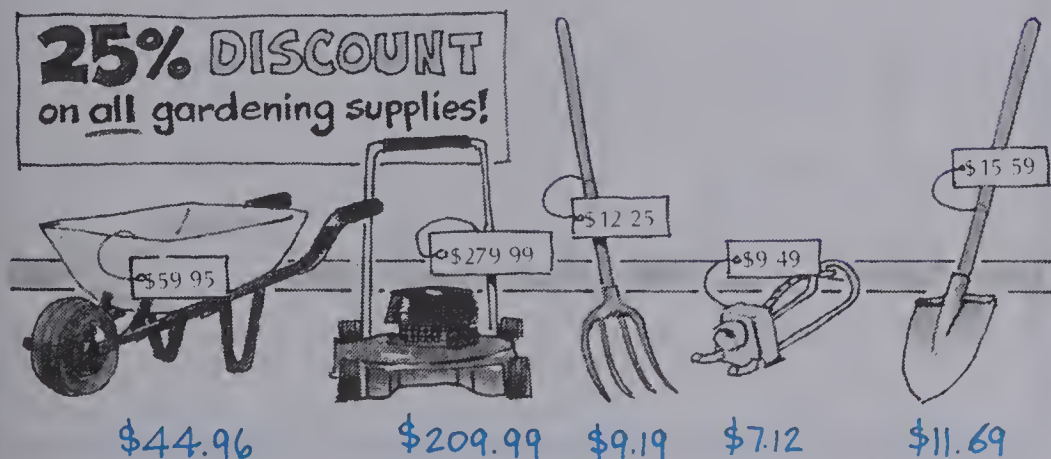
1. 25% of 52 **13**
2. 70% of 90 **63**
3. 36% of 25 **9**
4. 12% of 75 **9**
5. 95% of 60 **57**
6. 15% of 20 **3**
7. 64% of 325 **208**
8. 35% of 480 **168**
9. 8% of 175 **14**
10. 16% of 400 **64**
11. 40% of 590 **236**
12. 50% of 488 **244**
13. 34% of 300 **102**
14. 14% of 195 **27.3**
15. 69% of 5000 **3450**
16. 22% of 4200 **924**
17. 57% of 347 **197.79**
18. 3% of 2500 **75**
19. 42% of \$25 **\$10.50**
20. 16% of \$4000 **\$640**
21. 75% of \$350 **\$262.50**
22. 8% of \$915 **\$73.20**
23. 62% of \$500 **\$310.00**
24. 5% of \$80 **\$4.00**

Solve.

25. Mr. Weiss deposited \$5000 at the bank. At the end of one year, he collected 15% interest. How much interest did he collect? **\$750**
26. The original price of a fur coat is \$8500. The discount is 20% of the original price. What is the amount of the discount? What is the sale price of the coat? **\$1700 off, price is \$6800**

USING THE CALCULATOR

Use a calculator to find the sale price of each item.



211

Assigning the Practice

Minimum: 1-15, 25-26

Average: 10-26

Enriched: 10-26

Reinforcement

1. Assign *Using the Calculator* at the bottom of page 211.

2. Show the students how to check their work on page 211 with a calculator. Explain how to calculate the products with and without the percent key.

a. 12% of 75 = $\boxed{12\% \times 75 =}$
or $\boxed{75 \times 12\%}$

Calculators program percent differently. Check the instruction book for the calculator for the procedure.

b. 0.12×75 $\boxed{.12 \times 75 =}$

3. Display ads for several items from a hardware store. Students should calculate the amount of discount and the sale price.

Enrichment

1. Have the students calculate the products on page 210 again using the fraction equivalent for the percent.

2. Ask the students to compute the amount of interest that would be earned after one year with the following interest rates and capital amounts.

Interest rate	Money invested	Amount of interest
$12\frac{1}{2}\%$	\$500	
$14\frac{1}{2}\%$	\$1050	
$13\frac{1}{4}\%$	\$820	
$15\frac{3}{4}\%$	\$6500	

Extra Practice

Calculate.

1. 20% of 10 **2**
2. 25% of 25 **6.25**
3. 10% of 40 **4**
4. 68% of 200 **136**
5. 52% of 350 **182**
6. 79% of 40 **31.6**
7. 6% of 81 **4.86**
8. 13% of 43 **5.59**
9. 5% of 220 **11**
10. 3% of 117 **3.51**
11. 21% of 68 **14.28**
12. 7% of 387 **27.09**

Solve.

13. Mrs. Wyatt receives a 15% commission on her sales. If her sales amount to \$2050, how much commission does she receive? **\$307.50**
14. Mr. Wong marks up items in his store by 30% to cover his costs. **\$19.20**
If an item costs him \$64, how much markup will he add to the price?

Worksheet A49

Pages 210-211

Objective PS10

Solve problems involving percents.

Introducing the Lesson

Review naming the equivalent percent for a fraction with these kinds of questions and illustrations.

"What percent is 6 out of 10?"



"What percent is 1 out of 4?"



"What percent is 4 out of 5?"



Note that the strategy for answering the question is to write a fraction and then change that to a percent.

Teaching the Lesson

Read and discuss the problem at the top of page 212. Point out that a percent was needed. Explain the strategy.

- Write the fraction.
- Change the fraction to a percent.

Work through each *IDEA* step with the students.

Try another kind of percent problem. John collects \$90 on his paper route and gets to keep 30% of it. How much does he get to keep? Ask, "Are we looking for the percent as we did earlier?" Point out that we are now looking for the percent of a number. Have a student solve the problem. Explain that the students can now solve two kinds of percent problems:

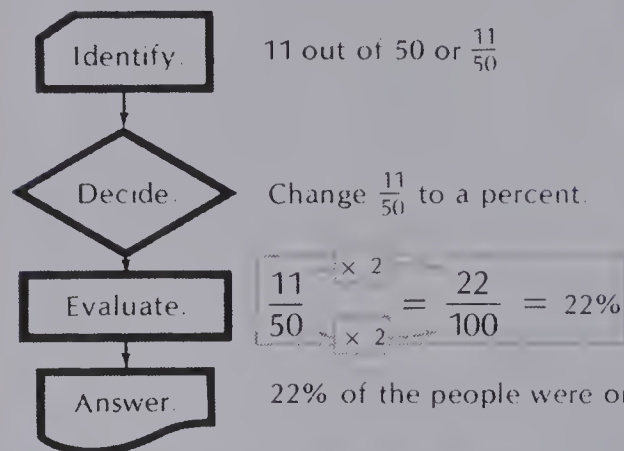
- problems looking for the percent
- problems looking for the percent of a number.

Ask the students to identify what kind of percent problem each of the following is and then solve.

- Tyler collected \$80 on his paper route. His commission is \$24. What percent does he keep?
- Jack earned \$500 on his paper route last summer. He bought a new bicycle with 20% of that money. How much did the new bicycle cost?

Percent Problems

Eleven of the fifty people on Brian's paper route are on holidays. What percent of the people are on holidays?



EXERCISES

Find the percent.

- Edela got 43 out of 50 answers correct on a test. What percent of the answers were wrong? **14%**
- In a sample of 20 cars in a parking lot, 3 were convertibles. What percent of the cars are convertibles? **15%**
- In a school field day, 7 of 10 long jumps were over 3 m. What percent of the jumps were under 3 m? **30%**

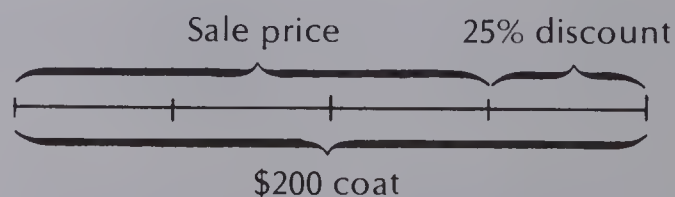
Find the amount.

- The cost of a car is \$9500. Sales tax is 5% of the cost. What is the amount of sales tax? What is the total cost of the car?
Tax - \$475 Cost - \$9975
- The original price of a coat is \$200. The discount is 25% of the original price. What is the amount of the discount? What is the sale price? **Discount - \$50 Price - \$150**

212

Using the Exercises

- Questions 1 to 3 require students to find percents. See that they set up their fractions (which will be changed to a percent) correctly.
- Questions 4 and 5 require students to find the percent of a number. For students having difficulty with question 5 (discount/sale price), the following diagram may help.



PRACTICE

Solve.

- In Layton, which has a population of 5000, 34% of the people live on the west side of the river that runs through the town. How many people live east of the river? **3300**
- 25% of the mail that goes through Beetown's post office goes out of town. 10% goes out of the province.
 - In a day when they process 860 letters, how many are likely to go out of town? **215**
 - How many letters would have to be delivered locally? **559**
- Seville's school board predicts a 12% drop in enrolment next year. There are 6400 students in school this year. How many are there likely to be next year? **5632**
- Mary wrote a math quiz which had 70 questions worth 1 point each and 15 questions worth 2 points each. She answered 80 questions correctly and scored 90%. How many of each type of question did she answer correctly? **70, 10**

REVIEW

- N17** Write the equivalent decimal and percent.
- $\frac{16}{100}$ **0.16** **16%**
 - $\frac{37}{100}$ **0.37** **37%**
 - $\frac{70}{100}$ **0.70** **70%**
 - $\frac{1}{100}$ **0.01** **1%**
 - $\frac{100}{100}$ **1.00** **100%**
- N18** Write the equivalent percent.
- $\frac{3}{4}$ **75%**
 - $\frac{23}{50}$ **46%**
 - $\frac{17}{20}$ **85%**
 - $\frac{10}{10}$ **100%**
 - $\frac{16}{25}$ **64%**
- N19** Write an equivalent fraction in simplest terms.
- 60% **$\frac{3}{5}$**
 - 72% **$\frac{18}{25}$**
 - 75% **$\frac{3}{4}$**
 - 45% **$\frac{9}{20}$**
 - 6% **$\frac{3}{50}$**
- A49** Calculate.
- 25% of 60 **15**
 - 96% of 50 **48**
 - 16% of 25 **4**

213

Assigning the Practice

Minimum: 1-4

Average: 1-4

Enriched: 1-4

Review Exercises

Questions	Objective	Pages
1-5	N17	204-205
6-10	N18	206-207
11-15	N19	208-209
16-18	A49	210-211

Reinforcement

Make up a set of price tags like the following. Have the students calculate the sale price for each.

- ☐ 25% off
\$19.95
- ☐ 40% off
\$99.50
- ☐ 10% off
\$1.29
- ☐ 20% off
\$5999

Enrichment

Ask the students to interview 20 different classmates. Have them ask questions in their interviews that would enable them to find these percents.

- What percent of those interviewed have no brothers or sisters?
- What percent of those interviewed were born in Canada?
- What percent of those interviewed speak two or more languages?
- What percent of those interviewed play a musical instrument?
- What percent of those interviewed are girls?

Problem Solving Activities

Assign Level 6, Unit 9

Extra Practice

Worksheet PS10

Pages 212-213

Solve.

- Of the 60 students in grade 6, 35% voted for Lenore for class president. How many votes did she receive? **21**
- Acme Motors' sales last month were \$587 000. This month their sales were down 10%. How much did their sales drop? What were their sales this month? **\$58 700** **\$528 300**
- Roller skates that usually cost \$79 were marked 25% off. By how much is the price reduced? What is the new price? **\$19.75** **\$59.25**
- 75% of the students at Kincaid School eat in the cafeteria. If there are 536 students in the school, how many eat in the cafeteria? How many don't eat in the cafeteria? **402 Do** **134 Don't**

Unit 9 Objectives	Test Questions	Pages
A47	1-2	194-195
A48	3-4	196-197
N15	5-8	198-199
N16	9-12	200-201
N17	13-16	204-205
N18	17-20	206-207
N19	21-24	208-209
A49	25-27	210-211
PS	28-29	

TEST

UNIT 9

Solve.

- 4 boxes cost \$2.80. What is the cost per box? $\$0.70$
- 1 m costs \$7.50. What do 8 m cost? $\$60.00$
- At 190 km in 2 h, how far can a car travel in 8 h? 760 km
- Pat swam 250 m in 5 min. What is her speed in metres per minute? 50 m/min

Write a ratio to compare these numbers of objects.

- 3 pencils to 2 students $\frac{3}{2}$
- 6 pears to 15 plums $\frac{6}{15}$
- 18 motorists to 5 cyclists $\frac{18}{5}$
- 11 radishes to 8 carrots $\frac{11}{8}$

Find the value of N .

- $\frac{8}{11} = \frac{N}{44}$ 32
- $\frac{N}{7} = \frac{30}{35}$ 6
- $\frac{9}{13} = \frac{27}{N}$ 39
- $\frac{7}{N} = \frac{49}{56}$ 8

Write the equivalent decimal and percent.

- $\frac{68}{100}$ 0.68 68%
- $\frac{31}{100}$ 0.31 31%
- $\frac{1}{100}$ 0.01 1%
- $\frac{105}{100}$ 1.05 105%

Write the equivalent percent.

- $\frac{17}{20}$ 85%
- $\frac{1}{5}$ 20%
- $\frac{7}{50}$ 14%
- $\frac{13}{25}$ 52%

Write an equivalent fraction in simplest terms.

- 2% $\frac{1}{50}$
- 44% $\frac{11}{25}$
- 95% $\frac{19}{20}$
- 80% $\frac{4}{5}$

Calculate.

- 28% of 625 175
- 9% of 900 81
- 35% of \$18 $\$6.30$

Solve.

- 3 cans of beans cost \$1.67. How much will 9 cost? $\$5.01$
- Fifteen people are on an elevator. 9 are men. What percent of the people are men? 60%

214

Post-test

Unit 9

Solve.

- 3 cartons cost \$2.73. What does one carton cost? $\$0.91$
- One litre costs \$0.84. How much do 4 L cost? $\$3.36$
- At 14 m in 3 s, how far can a runner go in 9 s? 42 m
- The Dales drove 228 km in 3 h. About how far did they go each hour? 76 km

Write a ratio to compare these numbers of things.

- 9 girls to 10 boys $\frac{9}{10}$
- 10 violins to 3 clarinets $\frac{10}{3}$
- 4 trucks to 98 cars $\frac{4}{98}$
- 20 desks to 20 students $\frac{20}{20}$

Find the value of N .

- $\frac{7}{10} = \frac{N}{30}$ 21
- $\frac{N}{8} = \frac{20}{32}$ 5
- $\frac{2}{5} = \frac{10}{N}$ 25
- $\frac{9}{N} = \frac{36}{64}$ 16

Multiply.

1. $\frac{2}{3} \times 8$ $5\frac{1}{3}$
2. $\frac{7}{8} \times 20$ $17\frac{4}{8}$
3. $16 \times \frac{1}{6}$ $2\frac{2}{3}$
4. $50 \times \frac{5}{12}$ $20\frac{5}{6}$
5. $\frac{3}{4} \times \frac{6}{5}$ $\frac{9}{10}$
6. $\frac{1}{2} \times \frac{9}{10}$ $\frac{9}{20}$
7. $\frac{2}{3} \times \frac{11}{12}$ $\frac{11}{18}$
8. $\frac{3}{5} \times \frac{5}{7}$ $\frac{3}{7}$
9. $8 \times 5\frac{1}{2}$ 44
10. $\frac{1}{4} \times 4\frac{4}{5}$ $1\frac{1}{5}$
11. $2\frac{2}{3} \times 9$ 24
12. $3\frac{5}{8} \times \frac{2}{5}$ $1\frac{9}{20}$
13. $1\frac{3}{5} \times 2\frac{1}{4}$ $3\frac{3}{5}$
14. $5\frac{1}{2} \times 2\frac{1}{2}$ $13\frac{3}{4}$
15. $5\frac{1}{4} \times 3\frac{1}{5}$ $16\frac{4}{5}$
16. $1\frac{3}{4} \times 2\frac{1}{5}$ $3\frac{17}{20}$
17. $\begin{array}{r} 6.7 \\ \times 18 \\ \hline 120.6 \end{array}$
18. $\begin{array}{r} 5.08 \\ \times 35 \\ \hline 177.8 \end{array}$
19. $\begin{array}{r} 4.002 \\ \times 6 \\ \hline 24.012 \end{array}$
20. $\begin{array}{r} 7.245 \\ \times 69 \\ \hline 499.905 \end{array}$
21. $\begin{array}{r} 0.3 \\ \times 0.6 \\ \hline 0.18 \end{array}$
22. $\begin{array}{r} 0.9 \\ \times 0.7 \\ \hline 0.63 \end{array}$
23. $\begin{array}{r} 0.1 \\ \times 0.1 \\ \hline 0.01 \end{array}$
24. $\begin{array}{r} 0.5 \\ \times 0.4 \\ \hline 0.20 \end{array}$
25. $\begin{array}{r} 6.3 \\ \times 2.9 \\ \hline 18.27 \end{array}$
26. $\begin{array}{r} 4.5 \\ \times 7.1 \\ \hline 31.95 \end{array}$
27. $\begin{array}{r} 6.5 \\ \times 8.2 \\ \hline 53.3 \end{array}$
28. $\begin{array}{r} 5.8 \\ \times 3.3 \\ \hline 19.14 \end{array}$
29. $\begin{array}{r} 0.06 \\ \times 0.5 \\ \hline 0.03 \end{array}$
30. $\begin{array}{r} 0.09 \\ \times 0.4 \\ \hline 0.036 \end{array}$
31. $\begin{array}{r} 0.07 \\ \times 0.8 \\ \hline 0.056 \end{array}$
32. $\begin{array}{r} 0.09 \\ \times 0.1 \\ \hline 0.009 \end{array}$
33. $\begin{array}{r} 6.58 \\ \times 2.3 \\ \hline 15.134 \end{array}$
34. $\begin{array}{r} 7.49 \\ \times 4.5 \\ \hline 33.705 \end{array}$
35. $\begin{array}{r} 3.35 \\ \times 8.9 \\ \hline 29.815 \end{array}$
36. $\begin{array}{r} 8.04 \\ \times 5.2 \\ \hline 41.808 \end{array}$

Make a table. Solve the problem.

37. A rectangle has an area of 36 m^2 . What are its length and width if it has the smallest possible perimeter?
 $L = 6 \text{ m}$
 $W = 6 \text{ m}$
38. Sandra has a roll of wire fencing 48 m long. What is the largest area that she can enclose using a rectangular shape?
 144 m^2

Write the equivalent decimal and percent.

1. $\frac{12}{100}$ 0.12 12%
14. $\frac{3}{100}$ 0.03 3%
15. $\frac{95}{100}$ 0.95 95%
16. $\frac{125}{100}$ 1.25% 125%

Write the equivalent percent.

7. $\frac{7}{25}$ 28%
18. $\frac{2}{5}$ 40%
19. $\frac{4}{10}$ 40%
20. $\frac{17}{50}$ 34%

Write an equivalent fraction in simplest terms.

1. 18% $\frac{9}{50}$
22. 4% $\frac{1}{25}$
23. 25% $\frac{1}{4}$
24. 45% $\frac{9}{20}$

Calculate.

5. 14% of 200 28
26. 8% of 76 6.08
27. 33% of 198 65.34

Solve.

8. Tony earns \$7.50 for 3 h work. How much would he earn for 10 h work?
 $\$25.00$
9. There are 240 students at Nicolet School. 20% came down with measles. How many students had measles?
 48

UNIT 10

Division with Fractions and Decimals

Theme: Arts and Crafts

Lesson	Objective		Pages
Preview		Multiplication of fractions and decimals.	217
1	N20	Understand the concept of a reciprocal; give the reciprocal of a number.	218-219
2	A50	Divide a fraction by a whole number.	220-221
3	A51	Divide a whole number or a fraction by a unit fraction.	222-223
4	A52	Divide a whole number, fraction, or mixed number by a fraction.	224-225
5	A53	Divide a decimal by a one- or two-digit whole number (no remainder).	226-227
6	A54	Divide a whole number or a decimal by a decimal in tenths (no remainder).	228-229
7	A55	Divide a whole number or a decimal by a decimal in hundredths (no remainder).	230-231
8	A56	Divide a whole number or a decimal by a whole number or a decimal in tenths or hundredths, with remainders. Round the quotient to the nearest tenth or hundredth.	232-233
9	A57	Express a fraction as a decimal; round the quotient to the nearest tenth or hundredth.	234-235
10	PS11	Solve problems using a <i>Guess and Check</i> strategy.	236-237
Test		Division with Fractions and Decimals	238
Review		Ratios	239

About This Unit

The aim of this unit is to develop skills in dividing fractions and decimals. The approach to the division of fractions is an intuitive one. Students are shown two interpretations of a problem: division by a number and multiplication by the reciprocal of the number. Thus, they learn to use the latter as an alternative method of solution rather than as a mechanical rule.

Division with fractions precedes division with decimals at the Grade 6 level in order for the students to achieve real understanding of the process. It is possible to teach decimal division by analogy with whole numbers, using estimation to place the decimal point in the quotient, as was done in Level 5. However, full understanding can be achieved only when the fraction algorithm is studied first.

Division with decimals uses the same algorithm as division with whole numbers. Students are taught to write an equivalent problem in which the divisor is a whole number by multiplying both the dividend and the divisor by either 10 or 100. They are shown a parallel example involving fractions in which the numerator and denominator are both multiplied by 10 or 100. This reinforces the meaning of the algorithm.

Ideas

The theme of this unit is *Arts and Crafts*. It will be most effective to have students repeatedly demonstrate division involving fractions by cutting up squares made of coloured construction paper, where a whole square represents "1".

Examples

1. $2 \div \frac{1}{3} = \blacksquare$



2 squares represent "2".

We want to know how many thirds there are in 2 wholes. Cut each whole into thirds.

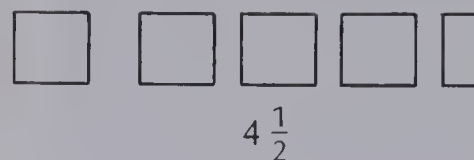


So, there are 6 thirds in 2 wholes. $2 \div \frac{1}{3} = 6$

Show that you can multiply by the reciprocal to get the same result.

$$2 \div \frac{1}{3} = 2 \times 3 = 6$$

2. $4 \frac{1}{2} \div \frac{3}{4} = \blacksquare$



How many $\frac{3}{4}$ s are there in $4 \frac{1}{2}$?

Mark off the squares in fourths.



Cut off $\frac{3}{4}$ of each whole.



Arrange the pieces in groups, each representing $\frac{3}{4}$.



So, there are **six** $\frac{3}{4}$ s in $4 \frac{1}{2}$.

$$4 \frac{1}{2} \div \frac{3}{4} = 6$$

Show that multiplying by the reciprocal gives the same result.

$$\begin{aligned} 4 \frac{1}{2} \div \frac{3}{4} &= \frac{9}{2} \div \frac{3}{4} \\ &= \frac{9}{2} \times \frac{4}{3} \\ &= \frac{36}{6} \\ &= 6 \end{aligned}$$

Many examples of the types shown above should be presented along with the lesson examples given in the unit. It is very important for the students to see the results, so that division is not taught as a purely abstract, rote algorithm.

UNIT 10

DIVISION WITH FRACTIONS & DECIMALS



Unit 10 Objectives	Test Questions	Pages
N20	1-4	218-219
A50	5-8	220-221
A51	9-12	222-223
A52	13-16	224-225
A53	17-19	226-227
A54	20-22	228-229
A55	23-25	230-231
A56	26-28	232-233
A57	29-32	234-235
PS	33	

Pretest

Unit 10

What is the reciprocal?

1. $\frac{1}{2}$ 2 2. $\frac{3}{8}$ $\frac{8}{3}$ 3. 9 $\frac{1}{9}$ 4. $\frac{1}{11}$ 11

Divide.

5. $\frac{2}{3} \div 4$ $\frac{1}{6}$ 6. $\frac{1}{2} \div 8$ $\frac{1}{16}$ 7. $\frac{5}{6} \div 2$ $\frac{5}{12}$ 8. $\frac{3}{10} \div 4$ $\frac{3}{40}$
 9. $7 \div \frac{1}{2}$ 14 10. $\frac{3}{4} \div \frac{1}{4}$ 3 11. $6 \div \frac{1}{4}$ 24 12. $\frac{8}{9} \div \frac{1}{8}$ $7\frac{1}{9}$
 13. $\frac{1}{4} \div \frac{2}{3}$ $\frac{3}{8}$ 14. $9 \div \frac{3}{4}$ 12 15. $3\frac{1}{2} \div \frac{3}{8}$ $9\frac{1}{3}$ 16. $\frac{3}{4} \div \frac{5}{8}$ $1\frac{1}{5}$
 17. $6 \overline{)1.2}$ 0.2 18. $5 \overline{)16.5}$ 3.3 19. $4 \overline{)2.72}$ 0.68
 20. $0.4 \overline{)28}$ 70 21. $0.7 \overline{)6.3}$ 9 22. $1.5 \overline{)0.75}$ 0.5

Patchwork Quilt

Multiply.

Top Half (Fractions):

- $\frac{3}{5} \times 15 = 9$
- $\frac{7}{10} \times 7 = 4\frac{9}{10}$
- $\frac{4}{25} \times 50 = 8$
- $\frac{3}{4} \times 17 = 12\frac{3}{4}$
- $1\frac{1}{2} \times 12 = 18$
- $1\frac{2}{5} \times 25 = 35$
- $2\frac{1}{4} \times 2 = 4\frac{2}{4}$
- $4\frac{1}{10} \times 5 = 20\frac{5}{10}$
- $\frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$
- $\frac{3}{4} \times \frac{3}{10} = \frac{9}{40}$
- $\frac{10}{25} \times \frac{7}{10} = \frac{7}{25}$
- $\frac{1}{4} \times \frac{4}{5} = \frac{1}{5}$
- $2\frac{1}{2} \times \frac{3}{4} = 1\frac{7}{8}$
- $\frac{1}{2} \times 1\frac{1}{4} = \frac{5}{8}$
- $\frac{3}{10} \times 2\frac{1}{5} = \frac{33}{50}$
- $1\frac{1}{5} \times \frac{4}{5} = 2\frac{4}{5}$

Bottom Half (Decimals):

- $0.6 \times 15 = 9$
- $0.7 \times 7 = 4.9$
- $0.16 \times 50 = 8$
- $0.75 \times 17 = 12.75$
- $1.5 \times 12 = 18$
- $1.4 \times 25 = 35$
- $2.25 \times 2 = 4.5$
- $4.1 \times 5 = 20.5$
- $0.2 \times 0.5 = 0.1$
- $0.75 \times 0.3 = 0.225$
- $0.4 \times 7 = 2.8$
- $0.25 \times 0.8 = 0.2$
- $2.5 \times 0.75 = 1.875$
- $0.5 \times 12.5 = 6.25$
- $0.3 \times 2.2 = 0.66$
- $1.2 \times 0.8 = 0.96$

Which set of questions was easier to do?

The answers in the quilts mostly match.

Which two pairs of questions do not match? **11, 14**

217

23. $0.05 \overline{)0.135} = 2.7$ 24. $0.06 \overline{)5.52} = 92$ 25. $0.33 \overline{)0.825} = 2.5$

Divide. Round the quotient to the nearest hundredth.

26. $0.7 \overline{)3.9} = 5.57$ 27. $11 \overline{)2} = 0.18$ 28. $2.3 \overline{)12.45} = 5.41$

Express the fraction as a decimal. Divide until the remainder is zero.

29. $\frac{3}{8} = 0.375$ 30. $\frac{7}{20} = 0.35$ 31. $\frac{13}{25} = 0.52$ 32. $\frac{67}{50} = 1.34$

Solve.

33. I am thinking of a number. If I multiply it by 3 and then subtract 4, the answer is 20. What is the number? **8**

UNIT 10

PREVIEW

Suggestions

Review fractional and decimal expressions for the same number.

$$\frac{3}{10} = 0.3 \quad \frac{1}{2} = 0.5 \quad \frac{1}{4} = 0.25$$

If the students need to use the intermediate step of changing the fraction to another fraction in tenths or hundredths, allow them to do this.

$$\frac{1}{2} = \frac{5}{10} = 0.5 \quad \frac{1}{4} = \frac{25}{100} = 0.25$$

Include mixed numbers in the examples.

$$2\frac{1}{5} = 2\frac{2}{10} = 2.2$$

Reverse the procedure, giving the decimal and asking for the fraction.

$$4.1 = 4\frac{1}{10} \quad 1.4 = 1\frac{4}{10} = 1\frac{2}{5}$$

$$0.56 = \frac{56}{100} = \frac{14 \times 4}{25 \times 4} = \frac{14}{25}$$

About the Page

Call attention to how the exercises are divided into two sets: 1 to 16 on the top half of the quilt and 1 to 16 on the bottom half. Note that the top half involves multiplying fractions and that the bottom half involves multiplying decimals. If you feel your students need to review each of these operations, have them carry out all of these multiplications before they answer the questions on the bottom of the page. However, if you feel your students are well prepared in this area, ask them to do number 1 of each set, then number 2 of each set, and so on. After doing a few pairs, the students should read the questions at the bottom of the page. It will then be a race to see who can find the unmatched pairs first. The students should be able to do this by inspection.

Reinforcement

If your students need practice in multiplying fractions, assign problems 1 to 12 of either the Pretest or the Post-test of Unit 8. If they need practice in multiplying decimals, assign problems 13 to 32 of the same Pretest or Post-test. If they need practice in changing fractions to decimals, assign Worksheet A36 for Lesson 7 of Unit 7 (page 159).

UNIT 10 LESSON 1

Objective N20

Understand the concept of a reciprocal; give the reciprocal of a number.

Introducing the Lesson

Ask the students to find the following products.

$$\frac{7}{10} \times \frac{10}{7}$$

$$\frac{3}{4} \times \frac{4}{3}$$

$$8 \times \frac{1}{8}$$

$$1\frac{1}{2} \times \frac{2}{3}$$

Discuss the results with the students. Ask them if they notice anything about the numerators and denominators when the product of two numbers is 1. Refer to these pairs of numbers as “buddies”. Ask students to find a buddy for each of these numbers.

$$\frac{1}{3} \times \underline{\quad} = 1 \quad \frac{2}{3} \times \underline{\quad} = 1 \quad \frac{3}{3} \times \underline{\quad} = 1$$

$$4 \times \underline{\quad} = 1 \quad 10 \times \underline{\quad} = 1 \quad 1 \times \underline{\quad} = 1$$

Teaching the Lesson

Examine the lesson example on page 218 together. Introduce the word **reciprocal**.

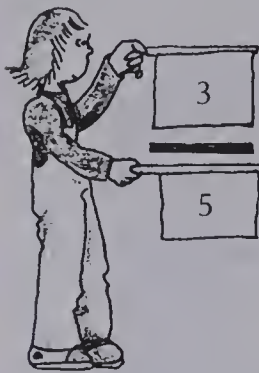
Write several pairs of numbers on the chalkboard and ask the students whether the numbers in each pair are reciprocals.

$$\frac{1}{5}, 5 \quad \frac{2}{9}, \frac{9}{2} \quad \frac{1}{7}, \frac{1}{2} \quad \frac{1}{6}, \frac{1}{6}$$

Discuss the method for determining whether numbers are reciprocals. That is, if you multiply them, the product is one.

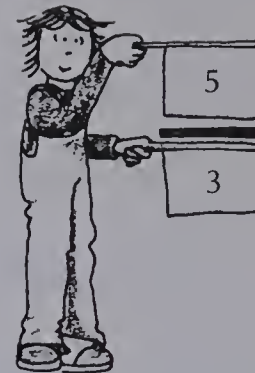
Ask students to show the multiplication.

Reciprocals



Two numbers whose product is 1 are **reciprocals** of each other.

$$\frac{3}{5} \times \frac{5}{3} = \frac{15}{15} = 1$$



$\frac{3}{5}$ and $\frac{5}{3}$ are reciprocals of each other.

The reciprocal of $\frac{9}{20}$ is $\frac{20}{9}$, because $\frac{9}{20} \times \frac{20}{9} = \frac{180}{180} = 1$.

The reciprocal of 6 is $\frac{1}{6}$, because $6 \times \frac{1}{6} = \frac{6}{6} = 1$.

EXERCISES

Are the two numbers reciprocals of each other?

1. $\frac{1}{2}$, 2 **Yes** 2. $\frac{4}{11}$, $\frac{11}{4}$ **Yes** 3. 10, $\frac{1}{10}$ **Yes** 4. $\frac{1}{3}$, $\frac{1}{3}$ **NO**

Copy and complete.

5. $\frac{4}{5} \times \frac{5}{4} = \frac{20}{20} = \blacksquare$ **1** 6. $7 \times \frac{1}{7} = \frac{7}{7} = \blacksquare$ **1** 7. $\frac{6}{11} \times \frac{\blacksquare}{\blacksquare} = \frac{66}{66} = 1$
 8. $\frac{18}{10} \times \frac{\blacksquare}{\blacksquare} = 1$ **$\frac{10}{18}$** 9. $\frac{\blacksquare}{\blacksquare} \times \frac{4}{3} = 1$ **$\frac{3}{4}$** 10. $\blacksquare \times \frac{1}{8} = 1$ **$\frac{8}{1}$**

What is the reciprocal of each number? Check by multiplying.

11. $\frac{2}{5}$ **$\frac{5}{2}$** 12. $\frac{3}{5}$ **$\frac{5}{3}$** 13. $\frac{4}{5}$ **$\frac{5}{4}$** 14. $\frac{1}{5}$ **5** 15. $\frac{5}{7}$ **$\frac{7}{5}$**
 16. $\frac{1}{3}$ **3** 17. $\frac{2}{3}$ **$\frac{3}{2}$** 18. $1\frac{1}{2}$ **$\frac{2}{3}$** 19. $\frac{3}{10}$ **$\frac{10}{3}$** 20. $\frac{3}{8}$ **$\frac{8}{3}$**
 21. $3\frac{1}{3}$ **$\frac{3}{10}$** 22. $3\frac{1}{3}$ **$\frac{1}{3}$** 23. $3\frac{1}{2}$ **$\frac{2}{7}$** 24. $3\frac{1}{4}$ **$\frac{4}{13}$** 25. $8\frac{1}{8}$

Using the Exercises

- Use the questions in the sequence in which they appear. If students still have difficulty with questions 11 to 15, give them more questions similar to questions 5 to 10. If they have difficulty with questions 18, 21, 23, and 24, review how to change a mixed number to a fraction.
- Remind students to check their answers for questions 11 to 25 by multiplying.

PRACTICE

Make a chart like this.

Number	Reciprocal	Product
$\frac{1}{2}$	2	$\frac{1}{2} \times 2 = \frac{2}{2} = 1$

List these numbers in the chart. Complete the chart.

1. $\frac{1}{10}$ 10 2. $\frac{2}{7}$ $\frac{7}{2}$ 3. $\frac{11}{4}$ $\frac{4}{11}$ 4. $3\frac{1}{3}$ 5. $7\frac{1}{7}$
 6. $\frac{24}{25}$ $\frac{25}{24}$ 7. $12\frac{1}{12}$ 8. $1\frac{1}{3}$ $\frac{3}{4}$ 9. $2\frac{2}{5}$ $\frac{5}{12}$ 10. $9\frac{1}{9}$

Copy and complete.

11. $6 \times \frac{1}{6} = 1$ 12. $\frac{50}{41} \times \frac{41}{50} = 1$ 13. $1\frac{4}{5} \times \frac{5}{9} = 1$
 14. $\frac{2}{9} \times \frac{9}{2} = 1$ 15. $10 \times \frac{1}{10} = 1$ 16. $3\frac{1}{3} \times \frac{3}{10} = 1$
 17. $\frac{7}{6} \times \frac{6}{7} = 1$ 18. $\frac{5}{12} \times 2\frac{2}{5} = 1$ 19. $8 \times \frac{1}{8} = 1$

Solve.

20. Katia took an hour off work. She promised to work an extra quarter hour every day to make up for it.
How many days will it take her to make up the hour? **4**
 21. A leaky pail was losing $\frac{2}{5}$ of its contents every hour.
If it was filled with water, how long would it take for all the contents to leak out? **$2\frac{1}{2}$ hours**

Puzzler

Find a number that does not have a reciprocal.

8 97 100 7 2 10 000
 $\frac{1}{1000}$ 9 $\frac{1}{10}$ 10 000 000 $\frac{1}{10 000}$
0

219

Assigning the Practice

Minimum: 1-19

Average: 1-21

Enriched: 1-21

Reinforcement

1. Write the following on the chalkboard and ask various students to complete them.

$$\frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1 \quad \frac{3}{8} \times \frac{8}{24} = \frac{24}{24} = 1$$

$$5 \times \frac{5}{5} = 1 \quad 9 \times \frac{9}{9} = 1$$

2. Assign *Puzzler* on the bottom of page 219. Zero has no reciprocal. Because $0 \times N = 0$ for every number N , there can be no number such that $0 \times N = 1$. Zero is the *only* number that does not have a reciprocal.

3. Make pairs of cards showing reciprocals. Have students use them to play Concentration.

Enrichment

1. Ask students to complete this chart.

	Sonia	Bert	Pat	Lee
Hours to complete one item	$\frac{1}{2}$		$\frac{1}{5}$	
Hours worked	3	4		6
Items completed		12	10	24

2. Find the reciprocal of each.

- a. $\frac{1}{2}$ b. 0.5 c. $\frac{1}{5}$ d. 0.2
 e. 0.8 f. 0.1 g. 0.25 h. 0.86
 i. 1.5 j. 3.25 k. 75% l. 30%

Extra Practice

Worksheet N20

Pages 218-219

Complete.

1. $\frac{2}{3} \times \frac{3}{2} = 1$ 2. $\frac{8}{4} \times \frac{4}{8} = 1$ 3. $\frac{7}{9} \times \frac{9}{7} = 1$
 4. $\frac{2}{7} \times \frac{7}{2} = 1$ 5. $3 \times \frac{1}{3} = 1$ 6. $5 \times \frac{1}{5} = 1$

Write the reciprocals. Check by multiplying.

7. $\frac{1}{6}$ **6** 8. $\frac{5}{6}$ **$\frac{6}{5}$** 9. $\frac{9}{2}$ **$\frac{2}{9}$** 10. $\frac{7}{8}$ **$\frac{8}{7}$**
 11. $\frac{3}{10}$ **$\frac{10}{3}$** 12. $3\frac{1}{2}$ **$\frac{2}{7}$** 13. $\frac{3}{16}$ **$\frac{16}{3}$** 14. $1\frac{1}{3}$ **$\frac{3}{4}$**

Solve.

15. Mr. Lerner is making cookies at the bakery. Each tray of cookies is baked $\frac{1}{4}$ of an hour. How many trays of cookies can he bake in an hour? **4**

UNIT 10 LESSON 2

Objective A50

Divide a fraction by a whole number.

Introducing the Lesson

Ask the students to draw several rectangular boxes and shade them to show these fractions.

$$\frac{1}{2} \quad \frac{3}{4} \quad \frac{1}{3} \quad \frac{2}{3}$$

Teaching the Lesson

Read and discuss the lesson example on page 220. Copy the two diagrams on the chalkboard. On the second diagram, extend the lines dividing $\frac{1}{2}$ into 3 parts so that the students can see that each part is $\frac{1}{6}$.

Discuss the two expressions $\frac{1}{2} \div 3 = \frac{1}{6}$ and $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$.

In the first rectangular box prepared in *Introducing the Lesson*, ask the students to draw lines to show $\frac{1}{2} \div 4$. At the chalkboard, extend the lines and ask how big each part is ($\frac{1}{8}$).



Use the first drawing to discuss how, when $\frac{1}{2}$ is divided into 4 parts, each part is $\frac{1}{8}$. On the chalkboard write:

$$\frac{1}{2} \div 4 = \frac{1}{8}$$

Use the second drawing to show how $\frac{1}{2}$ of $\frac{1}{4}$ is $\frac{1}{8}$.



Write: $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$. Compare the two mathematical expressions. Note that multiplying by the reciprocal of the divisor gives the same answer as dividing.

Use the same procedure with the rectangular boxes to show the students $\frac{3}{4} \div 3$, $\frac{1}{3} \div 3$, and $\frac{2}{3} \div 2$.

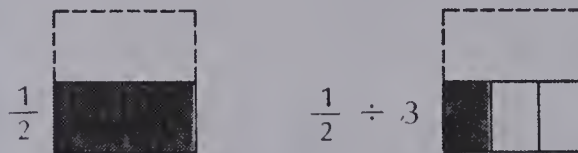
How are the numbers in these columns related?

$$\begin{aligned} \frac{1}{2} \div 4 &= \frac{1}{8} \text{ is the same as } \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}. \\ \frac{3}{4} \div 3 &= \frac{3}{12} \text{ is the same as } \frac{3}{4} \times \frac{1}{3} = \frac{3}{12}. \\ \frac{1}{3} \div 3 &= \frac{1}{9} \text{ is the same as } \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}. \\ \frac{2}{3} \div 2 &= \frac{2}{6} \text{ is the same as } \frac{2}{3} \times \frac{1}{2} = \frac{2}{6}. \end{aligned}$$

Dividing with Fractions

Dana is sewing felt designs on

cushions. She has $\frac{1}{2}$ square of red felt left. She wants to make 3 more cushions. How much red felt can she use on each cushion?



The $\frac{1}{2}$ square is divided into 3 parts. }
Each new part is $\frac{1}{6}$ of a whole square. }

or

Each new part is $\frac{1}{3}$ of a $\frac{1}{2}$ square. }

To **divide** a fraction by a whole number, **multiply** by the **reciprocal** of the divisor.



EXERCISES

Copy and complete.

$$\begin{aligned} 1. \quad \frac{1}{2} \div 2 &= \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} & 2. \quad \frac{1}{2} \div 3 &= \frac{1}{2} \times \frac{1}{3} = \frac{1}{6} \\ 3. \quad \frac{1}{2} \div 4 &= \frac{1}{2} \times \frac{1}{4} = \frac{1}{8} & 4. \quad \frac{3}{4} \div 2 &= \frac{3}{4} \times \frac{1}{2} = \frac{3}{8} \\ 5. \quad \frac{3}{4} \div 3 &= \frac{3}{4} \times \frac{1}{3} = \frac{3}{12} & 6. \quad \frac{3}{4} \div 4 &= \frac{3}{4} \times \frac{1}{4} = \frac{3}{16} \end{aligned}$$

Divide.

$$\begin{aligned} 7. \quad \frac{1}{3} \div 2 &= \frac{1}{6} & 8. \quad \frac{1}{10} \div 2 &= \frac{1}{20} & 9. \quad \frac{1}{5} \div 3 &= \frac{1}{15} & 10. \quad \frac{1}{7} \div 4 &= \frac{1}{28} \\ 11. \quad \frac{5}{9} \div 2 &= \frac{5}{18} & 12. \quad \frac{5}{6} \div 3 &= \frac{5}{18} & 13. \quad \frac{2}{3} \div 3 &= \frac{2}{9} & 14. \quad \frac{3}{4} \div 2 &= \frac{3}{8} \\ 15. \quad \frac{9}{10} \div 3 &= \frac{9}{30} & 16. \quad \frac{4}{7} \div 3 &= \frac{4}{21} & 17. \quad \frac{1}{8} \div 2 &= \frac{1}{16} & 18. \quad \frac{2}{5} \div 3 &= \frac{2}{15} \end{aligned}$$

220

Using the Exercises

- The first six questions reinforce the procedure. There is a sequence which should be pointed out: $\frac{1}{2}$ is divided first into 2 parts, then 3 parts, and then 4 parts. Notice the size of the answers. The sequence is repeated for $\frac{3}{4}$.
- Questions 7 to 18 provide practice in dividing a fraction by a whole number. Have the students write out the solutions in the same form as question 1.

PRACTICE

Divide. Write the answer in simplest terms.

1. $\frac{1}{3} \div 3 = \frac{1}{9}$
2. $\frac{1}{4} \div 2 = \frac{1}{8}$
3. $\frac{2}{5} \div 2 = \frac{1}{5}$
4. $\frac{5}{6} \div 2 = \frac{5}{12}$
5. $\frac{3}{4} \div 3 = \frac{1}{4}$
6. $\frac{1}{5} \div 2 = \frac{1}{10}$
7. $\frac{2}{3} \div 2 = \frac{1}{3}$
8. $\frac{1}{6} \div 2 = \frac{1}{12}$
9. $\frac{2}{3} \div 5 = \frac{2}{15}$
10. $\frac{1}{6} \div 5 = \frac{1}{30}$
11. $\frac{1}{5} \div 4 = \frac{1}{20}$
12. $\frac{3}{8} \div 2 = \frac{3}{16}$
13. $\frac{7}{10} \div 3 = \frac{7}{30}$
14. $\frac{3}{10} \div 7 = \frac{3}{70}$
15. $\frac{1}{10} \div 10 = \frac{1}{100}$
16. $\frac{7}{10} \div 100 = \frac{7}{1000}$
17. $1\frac{1}{2} \div 3 = \frac{1}{2}$
18. $2\frac{3}{4} \div 2 = \frac{11}{8}$ or $1\frac{3}{8}$
19. $1\frac{1}{8} \div 9 = \frac{1}{8}$
20. $3\frac{2}{3} \div 5 = \frac{11}{15}$

Write a division equation for each picture.

21.  $\frac{1}{2} \div 4$
22.  $\frac{2}{3} \div 4$
23.  $\frac{3}{4} \div 6$

Draw a picture for each division question.

24. $\frac{3}{5} \div 5$
25. $\frac{1}{3} \div 4$
26. $\frac{4}{7} \div 3$
27. $\frac{1}{4} \div 4$

Solve.

28. René has $\frac{2}{3}$ of a bag of chocolate chips. He wants to decorate 6 cupcakes with the chips. What part of the bag of chips should he use on each cupcake? $\frac{2}{18}$ or $\frac{1}{9}$
29. Sara wants to paint 2 model airplanes with $\frac{1}{3}$ of a can of paint. How much paint should she use on each airplane? $\frac{1}{6}$

Using Reciprocals

We can divide whole numbers by using the reciprocal of the divisor.

$$4 \div 3 = 4 \times \frac{1}{3} = \frac{4}{3} = 1\frac{1}{3}$$

Calculate.

1. $5 \div 3 = 1\frac{2}{3}$
2. $22 \div 3 = 7\frac{1}{3}$
3. $15 \div 7 = 2\frac{1}{7}$
4. $40 \div 9 = 4\frac{4}{9}$
5. $100 \div 11 = 9\frac{1}{11}$
6. $19 \div 6 = 3\frac{1}{6}$
7. $25 \div 12 = 2\frac{1}{12}$
8. $10 \div 3 = 3\frac{1}{3}$

221

Assigning the Practice

Minimum: 1-12, 21-27

Average: 5-28

Enriched: 9-29

Reinforcement

1. Have the students complete these.

- $\frac{1}{2} \div 3 = \frac{1}{6}$ is the same as $\frac{1}{2} \times \underline{\quad} = \frac{1}{6}$.
- $\frac{2}{3} \div 4 = \frac{2}{12}$ is the same as $\frac{2}{3} \times \underline{\quad} = \frac{2}{12}$.
- $\frac{3}{4} \div 2 = \frac{3}{8}$ is the same as $\frac{3}{4} \times \underline{\quad} = \frac{3}{8}$.
- $\frac{2}{3} \div 5 = \frac{2}{15}$ is the same as $\frac{2}{3} \times \underline{\quad} = \frac{2}{15}$.

Have the students write the rule for dividing a fraction by a whole number.

2. Label the sides of a die $\frac{1}{2}$, $\frac{1}{4}$, $\frac{2}{3}$, $\frac{1}{5}$, $\frac{5}{6}$, and $\frac{3}{8}$. Label the sides of another die 2, 3, 4, 5, and 6 (leave one side blank). Have the students play a game. A player rolls the dice and divides the fraction by the whole number. A point is scored for each correct answer. If a player rolls the blank side, he or she loses a turn.

Enrichment

Assign *Using Reciprocals* on the bottom of page 221. Have the students investigate what happens when they do these division questions on a calculator. They all produce infinite, repeating decimals.

Extra Practice

Worksheet A50

Pages 220-221

Divide.

1. $\frac{3}{4} \div 5 = \frac{3}{20}$
2. $\frac{7}{2} \div 8 = \frac{7}{16}$
3. $\frac{5}{6} \div 9 = \frac{5}{54}$
4. $\frac{5}{8} \div 5 = \frac{1}{8}$
5. $\frac{4}{7} \div 8 = \frac{4}{56}$
6. $\frac{2}{9} \div 6 = \frac{2}{54}$
7. $\frac{7}{10} \div 25 = \frac{7}{250}$
8. $\frac{6}{11} \div 4 = \frac{6}{44}$
9. $\frac{12}{13} \div 2 = \frac{12}{26}$
10. $\frac{1}{5} \div 8 = \frac{1}{40}$
11. $\frac{1}{4} \div 12 = \frac{1}{48}$
12. $\frac{7}{8} \div 2 = \frac{7}{16}$

Solve.

13. There was $\frac{1}{4}$ container of paste left. Four students shared it. How much did each student get? $\frac{1}{16}$
14. The supply box had $1\frac{1}{2}$ sheets of silver foil. Three students needed silver foil. How much foil did each student get? $\frac{1}{2}$

UNIT 10 LESSON 3

Objective A51

Divide a whole number or a fraction by a unit fraction.

Introducing the Lesson

Have each student cut out six, 4 cm × 4 cm squares of paper.

Ask: □ □ □ □ □ □

1. How many groups of 3 are there in 6?

Count 2. □ □ □ | □ □ □

We say $6 \div 3 = 2$. 2 groups of 3 in 6

2. How many groups of 2 are there in 6?

Count 3. □ □ | □ □ | □ □

We say $6 \div 2 = 3$. 3 groups of 2 in 6

3. How many groups of 1 are there in 6?

Count 6. □ | □ | □ | □ | □ | □

We say $6 \div 1 = 6$. 6 groups of 1 in 6

4. How many halves are there in 6?

Have students cut each square in half.

Then count 12. □ □ □ □ □ □ □ □ □ □ □ □

We say $6 \div \frac{1}{2} = 12$. 12 halves in 6

5. How many fourths do you think are in 6? How could you find out?

Teaching the Lesson

Read the lesson example on page 222 together. Discuss the interpretations of the expressions $3 \div \frac{1}{2} = 6$ and $3 \times 2 = 6$.

Point out the change in operation and the use of the reciprocal.

Refer again to the squares used in *Introducing the Lesson*. Ask the stu-

dents to show $6 \div \frac{1}{2}$. Write on the chalkboard:

$$6 \div \frac{1}{2} = 12 \quad 6 \times \blacksquare = 12$$

Students will supply the number 2.

Note the change in operation and the use of the reciprocal. Do several other similar examples with the students.

Write the following on the board and ask the students to complete it.

$$8 \div \frac{1}{2} = 16 \quad \rightarrow \quad 8 \times \blacksquare = \blacksquare$$

$$4 \div \frac{1}{2} = 8 \quad \rightarrow \quad 4 \times \blacksquare = \blacksquare$$

$$10 \div \frac{1}{2} = 20 \quad \rightarrow \quad 10 \times \blacksquare = \blacksquare$$

$$12 \div \frac{1}{2} = 24 \quad \rightarrow \quad 12 \times \blacksquare = \blacksquare$$

$$14 \div \frac{1}{2} = \blacksquare \quad \rightarrow \quad 14 \times \blacksquare = \blacksquare$$

Dividing by a Fraction

Uri is weaving squares for potholders.

He has 3 balls of yarn. Each potholder uses

$\frac{1}{2}$ ball. How many potholders can he make?



How many halves are there in 3 balls?

The diagram shows that he has 6 half-balls of yarn.

$$3 \div \frac{1}{2} = 6$$

or

He has 3 balls of yarn.

He can make 2 potholders from each ball.

$$3 \times 2 = 6$$

To **divide** a number by a fraction, **multiply** by the **reciprocal** of the divisor.

EXERCISES

Find how many you can make of each item from 12 balls of yarn.

1.	Balls of Yarn	Item	Number of Balls Needed for One Item	Number of Items
	12	sweater	4	$12 \div 4 = \blacksquare$ 3
	12	scarf	2	$12 \div 2 = \blacksquare$ 6
	12	socks	1	$12 \div 1 = \blacksquare$ 12
	12	gloves	$\frac{1}{2}$	$12 \div \frac{1}{2} = \blacksquare$ 24

Divide.

$$2. \quad 4 \div \frac{1}{3} = 4 \times 3 = \blacksquare$$
 12

$$3. \quad 5 \div \frac{1}{2} = 5 \times 2 = \blacksquare$$
 10

$$4. \quad 3 \div \frac{1}{5} = 3 \times \blacksquare = \blacksquare$$
 15

$$5. \quad 8 \div \frac{1}{4} = 8 \times \blacksquare = \blacksquare$$
 32

$$6. \quad \frac{1}{2} \div \frac{1}{10} = \frac{1}{2} \times \blacksquare = \blacksquare$$
 5

$$7. \quad \frac{1}{3} \div \frac{1}{4} = \frac{1}{3} \times \blacksquare = \blacksquare$$
 4/3

$$8. \quad \frac{2}{3} \div \frac{1}{2} = \frac{2}{3} \times \blacksquare = \blacksquare$$
 1 1/3

$$9. \quad \frac{4}{5} \div \frac{1}{3} = \frac{4}{5} \times \blacksquare = \blacksquare$$
 2 2/5

$$10. \quad 8 \div \frac{1}{3} = \blacksquare$$
 24

$$11. \quad \frac{1}{5} \div \frac{1}{2} = \blacksquare$$
 2/5

$$12. \quad \frac{3}{10} \div \frac{1}{3} = \blacksquare$$
 9/10

$$13. \quad \frac{7}{10} \div \frac{1}{7} = \blacksquare$$
 4 9/10

Using the Exercises

- Question 1 is an extension of the problem in the instructional part of page 222.
- Questions 2 and 3 require the students to study the related division and multiplication statements to find the product.
- Questions 4 to 9 require students to supply the reciprocal of the divisor, and then find the product.
- Questions 10 to 13 require the students to change the division statement to a multiplication statement and find the answer.

PRACTICE

Draw a diagram to help answer the questions.

- How many thirds are there in 2? **6**
- How many quarters are there in 3? **12**
- How many tenths are there in 2? **20**
- How many thirds are there in $\frac{2}{3}$? **2**
- How many fourths are there in $\frac{1}{2}$? **2**

Divide.

- $6 \div \frac{1}{2}$ **12**
- $7 \div \frac{1}{3}$ **21**
- $\frac{1}{2} \div \frac{1}{3}$ **$1\frac{1}{2}$**
- $\frac{2}{7} \div \frac{1}{5}$ **$1\frac{3}{7}$**
- $\frac{1}{8} \div \frac{1}{2}$ **$\frac{1}{4}$**
- $8 \div \frac{1}{4}$ **32**
- $\frac{2}{3} \div \frac{1}{5}$ **$3\frac{1}{3}$**
- $10 \div \frac{1}{5}$ **50**
- $\frac{4}{9} \div \frac{1}{2}$ **$\frac{8}{9}$**
- $\frac{3}{7} \div \frac{1}{2}$ **$\frac{6}{7}$**
- $12 \div \frac{1}{2}$ **24**
- $\frac{1}{4} \div \frac{1}{6}$ **$1\frac{1}{2}$**

Solve.

- It takes Marianne half an hour to bake a batch of cookies. How many batches of cookies can she bake in two hours? **4**
- It takes Tim about a quarter hour to complete each section of his model ship. How many sections will he be able to complete in half an hour? **2**

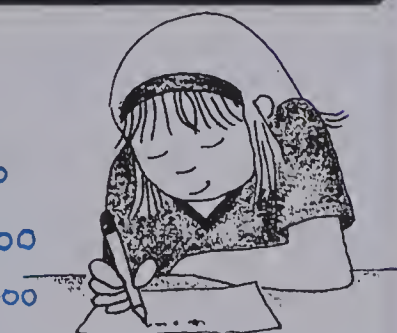
Infinity?

Write the next five equations in this pattern.

$$1 \div \frac{1}{10} = 10 \quad 1 \div \frac{1}{10000} = 10000$$

$$1 \div \frac{1}{100} = 100 \quad 1 \div \frac{1}{100000} = 100000$$

$$1 \div \frac{1}{1000} = 1000 \quad 1 \div \frac{1}{1000000} = 1000000$$



What happens to the quotient when the divisor gets smaller and smaller? **It gets larger.**

Is the divisor getting close to 0 or 1? **0**

Can you divide 1 by 0? **No**

$$1 \div \frac{1}{10000000} = 10000000$$

$$1 \div \frac{1}{100000000} = 100000000$$

223

Extra Practice

Worksheet A51

Pages 222-223

Divide.

- $3 \div \frac{1}{2}$ **6**
- $5 \div \frac{1}{4}$ **20**
- $8 \div \frac{1}{5}$ **40**
- $6 \div \frac{1}{3}$ **18**
- $\frac{1}{2} \div \frac{1}{2}$ **1**
- $\frac{1}{3} \div \frac{1}{4}$ **$1\frac{1}{3}$**
- $\frac{1}{9} \div \frac{1}{5}$ **$\frac{5}{9}$**
- $\frac{1}{7} \div \frac{1}{6}$ **$\frac{6}{7}$**
- $\frac{2}{3} \div \frac{1}{4}$ **$2\frac{2}{3}$**
- $\frac{3}{7} \div \frac{1}{5}$ **$2\frac{1}{7}$**
- $\frac{5}{6} \div \frac{1}{2}$ **$1\frac{2}{3}$**
- $\frac{5}{8} \div \frac{1}{3}$ **$1\frac{7}{8}$**

Solve.

- Sheva has 6 lengths of ribbon. She needs $\frac{1}{3}$ of a length for each award. How many award ribbons can she make? **18**
- Ralph has $\frac{1}{2}$ pail of clay. Each ceramic piece uses $\frac{1}{8}$ pail. How many ceramic pieces can he make? **4**

Assigning the Practice

Minimum: 1-9

Average: 1-19

Enriched: 6-19

Reinforcement

Assign the following practice.

Rule: $\div \frac{1}{2}$		Rule: $\div \frac{1}{3}$		Rule: $\div \frac{1}{4}$	
In	Out	In	Out	In	Out
4		6		8	
2		3		2	
$\frac{1}{2}$		$\frac{5}{6}$		$\frac{3}{4}$	
$\frac{1}{4}$		$\frac{2}{3}$		$\frac{2}{3}$	
$\frac{1}{8}$		$\frac{1}{3}$		$\frac{1}{2}$	

Enrichment

1. Assign *Infinity?* on the bottom of page 223.

Students should notice that, as the divisor gets smaller and smaller, the quotient gets larger and larger.

$$1 \div \frac{1}{10000} = 10000$$

$$1 \div \frac{1}{100000000} = 100000000$$

$$1 \div 0 = ?$$

There is no number big enough to satisfy the last equation because for every number N ,

$$N \times 0 = 0$$

$$N \times 0 \neq 1$$

2. We solved division questions in this lesson by multiplying by the reciprocal of the divisor.

$$4 \div \frac{1}{2} = 4 \times 2 = 8 \quad 6 \div \frac{1}{3} = 6 \times 3 = 18$$

$$3 \div \frac{1}{2} = 3 \times 2 = 6 \quad 4 \div \frac{1}{3} = 4 \times 3 = 12$$

What happens if we multiply by the reciprocal of the dividend?

$$4 \div \frac{1}{2} \rightarrow \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

Check the other examples. What do you notice? *The answers are the reciprocals of the quotients in the first set of questions.*

Objective A52

Divide a whole number, fraction, or mixed number by a fraction.

Introducing the Lesson

Review changing mixed numbers to fractions.

$$2\frac{3}{4} = \frac{11}{4} \quad 1\frac{2}{3} = \frac{5}{3} \quad 4\frac{1}{2} = \frac{9}{2}$$

If students need to write the intermediate step of changing the whole number to a fraction, allow them to do this.

$$2\frac{3}{4} = \frac{8}{4} + \frac{3}{4} = \frac{11}{4} \quad 1\frac{2}{3} = \frac{3}{3} + \frac{2}{3} = \frac{5}{3}$$

Then ask the students to write the reciprocal of each fraction.

Teaching the Lesson

Examine the lesson example on page 224 with the students. Point out that there are really two things to do to get the problem ready for computation:

- mixed numbers must be changed to fractions,
 - the expression should be changed to multiplication by the reciprocal.
- Rewrite the work for the lesson example in these two stages.

$$1\frac{1}{2} \div \frac{3}{8} = \frac{3}{2} \div \frac{3}{8} \\ = \frac{3}{2} \times \frac{8}{3}$$

Or, all in one row:

$$1\frac{1}{2} \div \frac{3}{8} = \frac{3}{2} \div \frac{3}{8} = \frac{3}{2} \times \frac{8}{3}$$

Have some students do these questions at the board.

$$3\frac{1}{2} \div \frac{2}{5} = \underline{\hspace{2cm}}$$

$$4\frac{1}{3} \div \frac{2}{3} = \underline{\hspace{2cm}}$$

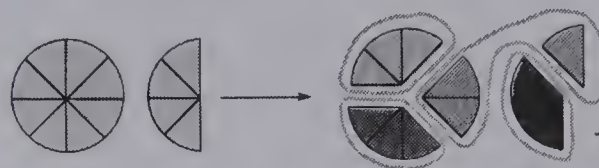
$$5\frac{2}{5} \div \frac{3}{4} = \underline{\hspace{2cm}}$$

Dividing by a Fraction

Sue has $1\frac{1}{2}$ bags of beads. She uses $\frac{3}{8}$ of a bag for each necklace.

How many necklaces can she make?

How many $\frac{3}{8}$ s are there in $1\frac{1}{2}$?



$$1\frac{1}{2} \div \frac{3}{8} = \frac{3}{2} \times \frac{8}{3} = \frac{24}{6} = 4$$

reciprocal of the divisor

Sue can make 4 necklaces.



EXERCISES

Copy and complete.

- $\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$
- $\frac{1}{2} \div \frac{3}{5} = \frac{1}{2} \times \frac{5}{3} = \frac{5}{6}$
- $8 \div \frac{2}{3} = 8 \times \frac{3}{2} = \frac{24}{2} = 12$
- $6 \div \frac{4}{5} = 6 \times \frac{5}{4} = \frac{30}{4} = 7\frac{1}{2}$
- $1\frac{1}{3} \div \frac{2}{7} = \frac{4}{3} \times \frac{7}{2} = 4\frac{2}{3}$
- $2\frac{1}{2} \div \frac{2}{3} = \frac{5}{2} \times \frac{3}{2} = 3\frac{3}{4}$

Divide. Write the quotient in simplest terms.

- $\frac{1}{5} \div \frac{2}{3} = \frac{3}{10}$
- $\frac{1}{2} \div \frac{5}{8} = \frac{4}{5}$
- $\frac{3}{4} \div \frac{1}{2} = 1\frac{1}{2}$
- $\frac{3}{8} \div \frac{3}{4} = \frac{1}{2}$
- $8 \div \frac{3}{4} = 10\frac{2}{3}$
- $6 \div \frac{5}{8} = 9\frac{3}{5}$
- $1\frac{1}{4} \div \frac{3}{5} = 2\frac{1}{12}$
- $2\frac{1}{3} \div \frac{3}{4} = 3\frac{1}{9}$
- $3\frac{2}{4} \div \frac{1}{8} = 28$
- $4\frac{1}{5} \div \frac{4}{10} = 10\frac{1}{2}$
- $7 \div \frac{1}{6} = 42$
- $2\frac{5}{8} \div \frac{5}{6} = 3\frac{3}{20}$

Using the Exercises

- Questions 1 to 6 assist the students in preparing the questions for computation. Supply as much practice in this form as they need.
- Questions 7 to 18 allow the students to do independent work. In the first row, a fraction is divided by a fraction. In the second and third rows, whole numbers and mixed numbers are involved. Watch where trouble spots occur.

PRACTICE

Write a division question. Solve it.

1. How many $\frac{2}{3}$ s are there in 2? **3**



2. How many $\frac{3}{5}$ s are there in $1\frac{1}{5}$? **2**



Divide.

3. $\frac{1}{3} \div \frac{3}{4} = \frac{4}{9}$ 4. $\frac{7}{8} \div \frac{2}{5} = 2\frac{3}{16}$ 5. $5 \div \frac{2}{3} = 7\frac{1}{2}$ 6. $1\frac{1}{8} \div \frac{3}{4} = 1\frac{1}{2}$
 7. $6 \div \frac{2}{3} = 9$ 8. $\frac{3}{5} \div \frac{1}{4} = 2\frac{2}{5}$ 9. $2\frac{1}{2} \div \frac{5}{6} = 3$ 10. $\frac{1}{2} \div \frac{3}{4} = \frac{2}{3}$
 11. $\frac{8}{9} \div \frac{2}{3} = 1\frac{1}{3}$ 12. $3 \div \frac{2}{3} = 4\frac{1}{2}$ 13. $1\frac{4}{5} \div \frac{3}{4} = 2\frac{2}{5}$ 14. $\frac{2}{3} \div \frac{2}{3} = 1$
 15. $4 \div \frac{3}{5} = 6\frac{2}{3}$ 16. $\frac{2}{3} \div \frac{3}{5} = 1\frac{1}{9}$ 17. $1\frac{1}{5} \div \frac{2}{3} = 1\frac{4}{5}$ 18. $\frac{5}{8} \div \frac{2}{3} = \frac{15}{16}$

Solve.

19. Carter has $2\frac{1}{2}$ boxes of tacks. If he uses $\frac{2}{3}$ of a box for each tack picture, how many pictures can he make? **$3\frac{3}{4}$**

REVIEW

Write the reciprocal of each number.

- N20 1. $\frac{1}{8}$ **8** 2. 3 **$\frac{1}{3}$** 3. $\frac{4}{9}$ **$\frac{9}{4}$**

Divide.

- A50 4. $\frac{1}{5} \div 2 = \frac{1}{10}$ 5. $\frac{5}{6} \div 3 = \frac{5}{18}$ 6. $\frac{3}{4} \div 4 = \frac{3}{16}$
 A51 7. $4 \div \frac{1}{2} = 8$ 8. $\frac{1}{3} \div \frac{1}{5} = \frac{5}{3} = 1\frac{2}{3}$ 9. $\frac{4}{5} \div \frac{1}{3} = \frac{12}{5} = 2\frac{2}{5}$
 A52 10. $\frac{2}{3} \div \frac{3}{5} = \frac{10}{9} = 1\frac{1}{9}$ 11. $3 \div \frac{3}{4} = 4$ 12. $1\frac{1}{2} \div \frac{2}{3} = \frac{9}{4} = 2\frac{1}{4}$

225

Assigning the Practice

Minimum: 1-14

Average: 1-19

Enriched: 7-19

Review Exercises

Questions	Objective	Pages
1-3	N20	218-219
4-6	A50	220-221
7-9	A51	222-223
10-12	A52	224-225

Reinforcement

Give the students the following exercises. Ask them to match the three columns.

- | | | |
|------------------------------------|--------------------------------------|-------------------|
| a. $1\frac{1}{2} \div \frac{2}{3}$ | n. $\frac{11}{4} \times \frac{2}{1}$ | v. 1 |
| b. $2\frac{3}{4} \div \frac{1}{2}$ | o. $\frac{3}{2} \times \frac{2}{3}$ | w. 11 |
| c. $1\frac{1}{2} \div \frac{3}{2}$ | p. $\frac{3}{2} \times \frac{3}{2}$ | x. $5\frac{1}{2}$ |
| d. $5\frac{1}{2} \div \frac{1}{2}$ | q. $\frac{5}{4} \times \frac{4}{3}$ | y. $1\frac{2}{3}$ |
| e. $1\frac{1}{4} \div \frac{3}{4}$ | r. $\frac{11}{2} \times \frac{2}{1}$ | z. $2\frac{1}{4}$ |

Enrichment

Give the students this rule: *If the numerator and the denominator are both divided by the same number, the value of the fraction is not changed.*

Give the students the following sequence to study.

$$\frac{3}{4} \times \frac{2}{5} = \frac{3 \times 2}{4 \times 5} = \frac{6}{20}$$

Divide by 2 to simplify.

$$\frac{6 \div 2}{20 \div 2} = \frac{3}{10}$$

Then show them the short form.

$$\frac{\cancel{3}}{\cancel{4}} \times \frac{\cancel{2}}{5} = \frac{3}{10}$$

Ask the students to explain these problems.

a. $\frac{\cancel{3}}{5} \times \frac{7}{\cancel{3}} = \frac{7}{15}$ b. $\frac{5}{\cancel{4}} \times \frac{\cancel{3}}{7} = \frac{15}{28}$

Extra Practice

Worksheet A52

Pages 224-225

Divide.

1. $\frac{1}{4} \div \frac{2}{5} = \frac{5}{8}$ 2. $\frac{1}{6} \div \frac{3}{7} = \frac{7}{18}$ 3. $3 \div \frac{3}{10} = 10$ 4. $\frac{3}{2} \div \frac{5}{3} = \frac{9}{10}$
 5. $2 \div \frac{5}{6} = 2\frac{2}{5}$ 6. $\frac{6}{7} \div \frac{2}{9} = 3\frac{6}{7}$ 7. $1\frac{1}{2} \div \frac{3}{4} = 2$ 8. $\frac{4}{9} \div \frac{2}{3} = \frac{2}{3}$
 9. $\frac{5}{9} \div \frac{8}{3} = \frac{5}{24}$ 10. $2\frac{1}{3} \div \frac{5}{7} = 3\frac{4}{15}$ 11. $6 \div \frac{3}{4} = 8$ 12. $\frac{5}{6} \div \frac{1}{3} = 2\frac{1}{2}$

Solve.

13. The Laceys have 2 bags of potatoes. They use $\frac{1}{3}$ bag for a meal. **6**
 How many meals will they have from the 2 bags of potatoes?
 14. Dick has $1\frac{1}{2}$ blocks of wax. A candle uses $\frac{1}{10}$ of a block. How many **15**
 candles can Dick make?

UNIT 10 LESSON 5

Objective A53

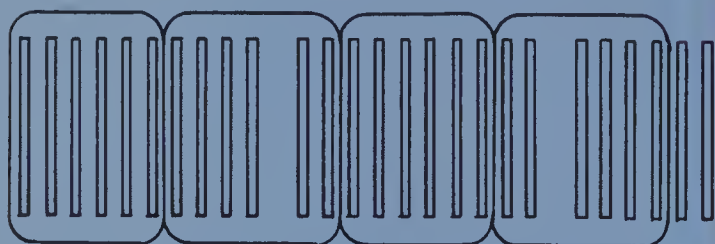
Divide a decimal by a one- or two-digit whole number (no remainder).

Introducing the Lesson

Ask the students to divide 2.6 by 4 using place-value materials.



They should suggest that the ones blocks be exchanged for tenths rods, making 26 tenths. Then they can separate 4 groups of 6 tenths.



The left-over tenths rods can be exchanged for 20 hundredths cubes, and these can be divided by 4 evenly. $2.6 \div 4 = 6$ tenths and 5 hundredths = 0.65

Alternatively, 2.6 can be changed to 260 hundredths.

$$260 \div 4 = 65$$

So, $2.6 \div 4 = 65$ hundredths = 0.65

Teaching the Lesson

Study the lesson example on page 226 together. Refer again to the illustration with place-value materials in Introducing the Lesson. Stress that the dividing procedure is exactly the same as for dividing whole numbers.

Show the sequence.

$$\begin{array}{r} 65 \\ 4 \overline{)260} \end{array} \quad \begin{array}{r} 6.5 \\ 4 \overline{)26.0} \end{array} \quad \begin{array}{r} 0.65 \\ 4 \overline{)2.60} \end{array}$$

Point out that a zero must be written in the ones place when there is no digit there in the quotient. Emphasize that digits should be lined up properly and that the decimal point in the quotient should be placed directly above the decimal point in the dividend.

After you have done questions 13 to 20 of the Exercises, discuss how adding zeros at the end of a decimal does not change its value. $2.4 = 2.40 = 2.400$

Dividing Decimals

Dominic bought 2.6 m of leather thong. He cut it into 4 equal lengths. How long is each piece?



$$2.6 \div 4 = ?$$

Put a decimal point in the quotient

$$\begin{array}{r} . \\ 4 \overline{)2.6} \end{array}$$

No ones.

$$\begin{array}{r} 0. \\ 4 \overline{)2.6} \end{array}$$

Divide.

$$\begin{array}{r} 0.6 \\ 4 \overline{)2.6} \\ \underline{-2.4} \\ 2 \end{array}$$

Write 2.6 as 2.60 and divide again.

$$\begin{array}{r} 0.65 \\ 4 \overline{)2.60} \\ \underline{-2.4} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

Each piece will be 0.65 m long.

EXERCISES

Divide

- | | | | |
|--------------------------|---------------------------|---------------------------|----------------------------|
| 1. $3 \overline{)69}$ | 2. $3 \overline{)6.9}$ | 3. $3 \overline{)0.69}$ | 4. $3 \overline{)0.069}$ |
| 5. $4 \overline{)12}$ | 6. $4 \overline{)1.2}$ | 7. $4 \overline{)0.12}$ | 8. $4 \overline{)0.012}$ |
| 9. $21 \overline{)441}$ | 10. $21 \overline{)44.1}$ | 11. $21 \overline{)4.41}$ | 12. $21 \overline{)0.441}$ |
| 13. $5 \overline{)0.5}$ | 14. $7 \overline{)8.4}$ | 15. $6 \overline{)14.4}$ | 16. $4 \overline{)467.6}$ |
| 17. $7 \overline{)0.07}$ | 18. $8 \overline{)0.56}$ | 19. $5 \overline{)2.25}$ | 20. $6 \overline{)80.64}$ |

Divide. You may need to write more zeros in the dividend.

- | | | | |
|--------------------------|---------------------------|---------------------------|--------------------------|
| 21. $5 \overline{)2.4}$ | 22. $5 \overline{)6.9}$ | 23. $4 \overline{)2.2}$ | 24. $4 \overline{)10.5}$ |
| 25. $25 \overline{)6.5}$ | 26. $25 \overline{)15.2}$ | 27. $15 \overline{)22.5}$ | 28. $6 \overline{)2.25}$ |
| 29. $5 \overline{)23}$ | 30. $10 \overline{)58}$ | 31. $25 \overline{)710}$ | 32. $4 \overline{)815}$ |

Using the Exercises

- Note the progression in the dividends in the first three rows of questions. Compare the answers in each row. This should help students to see the reasonableness of answers.
- Use questions 13 to 20 to give the students practice in the algorithm. Check that they are aligning digits and placing the decimal point correctly.
- Emphasize that rewriting a decimal with zeros at the end does not change its value. (However, mathematically, its **accuracy** is changed. Students should not be required to appreciate this at their present stage of development.)

$$2.4 = 2.40$$

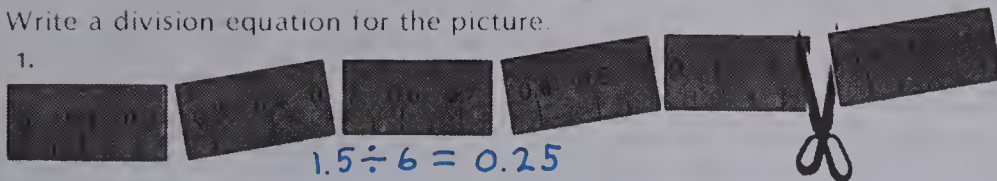
$$2.25 = 2.250$$

When the students are sure of this, show them how this can help them to divide further. Do questions 21 to 32.

PRACTICE

Write a division equation for the picture.

1.



Divide.

2. $8 \overline{)0.08}$ 0.01
3. $12 \overline{)3.6}$ 0.3
4. $15 \overline{)0.45}$ 0.03
5. $4 \overline{)22.4}$ 05.6
6. $33 \overline{)9.9}$ 0.3
7. $7 \overline{)0.091}$ 0.013
8. $7 \overline{)14.7}$ 2.1
9. $25 \overline{)7.5}$ 0.3
10. $35 \overline{)8.75}$ 0.25
11. $8 \overline{)33}$ 4.125
12. $6 \overline{)0.456}$ 0.076
13. $13 \overline{)15.6}$ 1.2
14. $5 \overline{)8.37}$ 1.674
15. $16 \overline{)20}$ 1.25
16. $9 \overline{)4.05}$ 0.45
17. $26 \overline{)0.182}$ 0.007
18. $3.08 \div 14$ 0.22
19. $5 \div 8$ 0.625
20. $0.81 \div 27$ 0.03
21. $182 \div 100$ 0.182
22. $12.6 \div 42$ 0.3
23. $0.328 \div 82$ 0.004
24. $2.9 \div 25$ 0.116
25. $98 \div 16$ 6.125

Solve.

26. The mass of 48 links in a gold chain is 99.36 g. What is the mass of each link? 2.07 g
27. Sandra's car used 51 L of gasoline on a trip of 400 km. At that rate, how much gas would she use to drive 100 km? 12.75 L

Budgets

Janis kept a record of her expenses for a week. She wanted to know what percent each item was.

Her allowance is \$6. She spent \$1.50 for a movie.

$$1.50 \div 6 = 0.25$$

She spent 25% of her allowance on a movie.

What percent did she spend on each of the other items?

25%	Movie	\$1.50
10%	Ice cream	0.60
15%	Transportation	0.90
8%	Apples	0.48
38%	Amusement park	2.28
4%	Savings	0.24
	Total	\$6.00

227

Assigning the Practice

Minimum: 1-13, 22-26

Average: 1-21, 27

Enriched: 14-27

Reinforcement

1. Make a list of decimal numbers and ask the students to write equivalent decimals with zeros on the ends. Then ask why this is useful in division problems. *It enables us to divide further. Then a remainder can often be avoided.*

2. Ask students to find the errors in the following examples.

$$\begin{array}{r} 2.9 \\ 4 \overline{)8.36} \\ \underline{8} \\ 0.36 \\ \underline{36} \\ 0 \end{array}$$

$$\begin{array}{r} 2.38 \\ 3 \overline{)7.14} \\ \underline{6} \\ 11 \\ \underline{9} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

$$\begin{array}{r} 4.8 \\ 8 \overline{)0.6} \\ \underline{8} \\ 0 \end{array}$$

$$\begin{array}{r} 0.08 \\ 4 \overline{)0.34} \\ \underline{34} \\ 0 \end{array}$$

$$\begin{array}{r} .27 \\ 5 \overline{)1.35} \\ \underline{10} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

$$\begin{array}{r} 0.05 \\ 8 \overline{)0.44} \\ \underline{40} \\ 4 \end{array}$$

Enrichment

Assign *Budgets* on the bottom of page 227.

Extra Practice

Worksheet A53

Pages 226-227

Divide.

1. $6 \overline{)8.4}$ 1.4
2. $7 \overline{)0.84}$ 0.12
3. $8 \overline{)0.448}$ 0.056
4. $3 \overline{)1.842}$ 0.614
5. $4 \overline{)1.84}$ 0.46
6. $5 \overline{)1.735}$ 0.347
7. $2 \overline{)0.06}$ 0.03
8. $9 \overline{)2.97}$ 0.33
9. $12 \overline{)44.4}$ 3.7
10. $24 \overline{)0.552}$ 0.023
11. $15 \overline{)3.90}$ 0.26
12. $26 \overline{)0.208}$ 0.008

Solve

13. Six pairs of socks cost \$20.82. What does one pair cost? $\$3.47$
14. Eight equal sections of clay have a total mass of 4.24 kg. What is the mass of one section? 0.53 kg

Objective A54

Divide a whole number or a decimal by a decimal in tenths (no remainder).

Introducing the Lesson

Review multiplying decimals by 10. Ask a student to illustrate 10×0.3 using place-value materials. The student could make ten sets of 3 tenths rods and then combine them to make 3 units. Write the following sequence on the chalkboard. Ask the students to multiply each number by 10 mentally and write the answer underneath.

$$10 \times 30 \quad 10 \times 3 \quad 10 \times 0.3$$

300

30

3

$$10 \times 0.03 \quad 10 \times 0.003$$

0.3

0.03

Show the students how multiplying by 10 can be done by moving the decimal point one place to the right.

0.3, 4.2, 71.8, 4.35
Have the students practise until they are sure of the procedure.

$$10 \times 0.5 = \underline{\quad} \quad 10 \times 0.8 = \underline{\quad}$$

$$10 \times 4.36 = \underline{\quad} \quad 10 \times 2.75 = \underline{\quad}$$

Teaching the Lesson

Read and discuss the lesson on page 228. Stress that *both* the divisor and the dividend must be multiplied by ten. Write the following sets of division problems on the chalkboard.

$$3 \overline{)15} \quad 30 \overline{)150}$$

$$2 \overline{)8} \quad 20 \overline{)80}$$

$$4 \overline{)3.6} \quad 40 \overline{)360}$$

Ask whether multiplying both the divisor and the dividend by 10 change the quotient. No. Point out that multiplying a decimal in tenths by 10 changes it to a whole number. This is useful since we already know how to divide by a whole number.

$$0.6 \overline{)18}$$

$18 \times 10 = 180$
 $0.6 \times 10 = 6$

$$0.6 \overline{)18.0}$$

$$\begin{array}{r} 30 \\ 6 \overline{)180} \\ \underline{18} \\ 00 \end{array}$$

Do several examples together.

Dividing by Tenths

Helene is doing cross-stitch embroidery on a towel. The border is 5.1 cm wide. Each row is 0.3 cm wide. How many rows are in the border?



$$5.1 \div 0.3 = ?$$

$$\frac{5.1}{0.3} = \frac{5.1 \times 10}{0.3 \times 10} = \frac{51}{3}$$

Multiply the divisor and the dividend by 10.

Divide.

$$0.3 \overline{)5.1}$$

$$0.3 \overline{)5.1}$$

$$\begin{array}{r} 17 \\ 3 \overline{)51} \\ \underline{-3} \\ 21 \\ \underline{-21} \\ 0 \end{array}$$

There are 17 rows in the border.

EXERCISES

Multiply each number by 10.

1. 20 **200**
2. 2 **20**
3. 0.2 **2**
4. 0.02 **0.2**
5. 0.002 **0.02**
6. 1.2 **12**
7. 0.12 **1.2**
8. 0.012 **0.12**
9. 0.16 **1.6**
10. 2.4 **24**

Divide.

11. $0.6 \overline{)0.3}$ **0.5**
12. $0.6 \overline{)6.3}$ **10.5**
13. $1.2 \overline{)4.8}$ **4**
14. $3.5 \overline{)10.5}$ **3**
15. $0.3 \overline{)0.72}$ **2.4**
16. $0.2 \overline{)0.32}$ **1.6**
17. $2.5 \overline{)1.75}$ **0.7**
18. $1.6 \overline{)5.44}$ **3.4**
19. $0.2 \overline{)0.824}$ **4.12**
20. $0.5 \overline{)6.375}$ **12.75**
21. $3.6 \overline{)1.008}$ **0.28**
22. $4.7 \overline{)1.645}$ **0.35**
23. $0.2 \overline{)4}$ **20**
24. $0.3 \overline{)18}$ **60**
25. $3.6 \overline{)144}$ **40**
26. $2.8 \overline{)4480}$ **1600**
27. $0.4 \overline{)3}$ **7.5**
28. $1.6 \overline{)30}$ **18.75**
29. $0.8 \overline{)9.1}$ **11.375**
30. $2.5 \overline{)62}$ **24.8**

228

Using the Exercises

- Point out the sequence in the first row (questions 1 to 3) and in the first three problems in the second row (questions 6 to 8). Add miscellaneous examples for extra practice, if necessary.
- Notice that in questions 11 to 26, each row presents a different type of dividend. Make sure students move the decimal point correctly for each type.
- Questions 27 to 30 are mixed practice.

PRACTICE

Find the quotient.

1. $0.3 \overline{)6}$ 20
2. $0.2 \overline{)0.8}$ 4
3. $2.4 \overline{)62.4}$ 26
4. $0.3 \overline{)0.09}$ 0.3
5. $0.2 \overline{)0.006}$ 0.03
6. $0.4 \overline{)48}$ 120
7. $0.4 \overline{)0.68}$ 1.7
8. $1.3 \overline{)3.9}$ 3
9. $1.5 \overline{)225}$ 150
10. $0.3 \overline{)0.057}$ 0.19
11. $0.5 \overline{)9.05}$ 18.1
12. $0.4 \overline{)0.512}$ 1.28

Divide. Check the answer.

13. $0.7 \overline{)39.48}$ 56.4
14. $2.3 \overline{)69}$ 30
15. $0.6 \overline{)5.676}$ 9.46
16. $1.5 \overline{)4.5}$ 3
17. $3.1 \overline{)89.9}$ 29
18. $0.5 \overline{)831.5}$ 1663
19. $2.7 \overline{)0.81}$ 0.3
20. $3.8 \overline{)0.228}$ 0.06

Solve.

21. Some heavy string costs 7.5¢/m. How much string could you buy for \$1.35? 18 m
22. Sara ran 100 m in 12.5 s.
 - a. What was her speed in metres per second? 8 m/s
 - b. What was her speed in metres per hour? 28800 m/h
 - c. What was her speed in kilometres per hour? 28.8 km/h
23. Mark's wallpaper strips are 0.8 m wide. How many strips does he need to paper a wall that is 5.5 m wide? 6.875

Computer Tutor

What will the computer print for each program?

Watch for special symbols. * means multiply, / means divide.

- | | | |
|--|--|---|
| a. 1 READ A, C
2 D = A + C
3 PRINT D 10
4 END | b. 1 READ B, C
2 E = B * C
3 PRINT E 3.36
4 END | c. 1 READ A, B
2 F = A / B
3 PRINT F 6
4 END |
|--|--|---|

DATA		
A	B	C
7.2	1.2	2.8

229

Assigning the Practice

Minimum: 1-16, 21

Average: 5-22

Enriched: 13-23

Reinforcement

Ask the students to multiply each of the following numbers by 10.

Note: Make a double set of these numbers and use one set for the next lesson's Reinforcement.

- | | | | |
|----------|----------|-----------|-----------|
| 1. 5 | 2. 16 | 3. 1.8 | 4. 43.29 |
| 5. 7.1 | 6. 85.37 | 7. 27.381 | 8. 230 |
| 9. 49 | 10. 1049 | 11. 0.2 | 12. 0.13 |
| 13. 9.35 | 14. 38.4 | 15. 0.01 | 16. 0.413 |

Enrichment

Assign *Computer Tutor* on the bottom of page 229. Three simple programs in BASIC programming language are presented. If necessary, explain each step.

"READ" tells the computer to find the appropriate numbers in the DATA chart.

The second line tells the computer what to do with the numbers, in these cases, add, multiply, or divide. The result is given a name (D, E, F, etc.).

"PRINT" tells the computer to show the result of the arithmetic.

"END" tells the computer that you are finished with the program.

Extra Practice

Worksheet A54

Pages 228-229

Divide.

1. $0.4 \overline{)24}$ 60
2. $0.6 \overline{)5.52}$ 9.2
3. $0.7 \overline{)0.511}$ 0.73
4. $0.3 \overline{)8.4}$ 28
5. $1.5 \overline{)0.15}$ 0.1
6. $1.7 \overline{)0.034}$ 0.02
7. $2.1 \overline{)4.2}$ 2
8. $3.5 \overline{)0.105}$ 0.03
9. $0.2 \overline{)0.64}$ 3.2
10. $0.3 \overline{)0.018}$ 0.06
11. $1.4 \overline{)5.6}$ 4
12. $3.3 \overline{)9.9}$ 3

Solve.

13. Mrs. Jardin has 7.5 kg of sugar for preserving strawberries. She uses 1.5 kg for each batch. How many batches can she make? 5
14. A room has an area of 23.2 m². The length is 5.8 m. What is the width? 4 m

Objective A55

Divide a whole number or a decimal by a decimal in hundredths (no remainder).

Introducing the Lesson

Review multiplication by 100. Write the following sequence on the chalkboard and ask the students for the answers.

$$\begin{array}{r} 40 \\ \times 100 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ \times 100 \\ \hline \end{array} \quad \begin{array}{r} 0.4 \\ \times 100 \\ \hline \end{array} \quad \begin{array}{r} 0.04 \\ \times 100 \\ \hline \end{array}$$

Then summarize the results in a table.

$\times 100$	40	4000
	4	400
	0.4	40
	0.04	4

Compare each pair of answers. Note the change in the location of the decimal point. Ask the students to suggest a rule for multiplying by 100. *Move the decimal point two places to the right.*

Teaching the Lesson

Discuss the lesson example on page 230. Emphasize that both the divisor and the dividend must be multiplied by 100.

Write the following sets of division problems on the chalkboard.

$$\begin{array}{r} 4 \overline{)12} \\ 3 \overline{)9} \\ 5 \overline{)2.5} \end{array} \quad \begin{array}{r} 400 \overline{)1200} \\ 300 \overline{)900} \\ 500 \overline{)250} \end{array}$$

Ask whether multiplying *both* the divisor and the dividend by the same number (here, 100) changed the quotient. No.

Point out that multiplying a decimal in hundredths by 100 changes it to a whole number.

$$0.12 \times 100 = 12$$

We know how to divide by a whole number; so if a problem involves dividing by a decimal, we write an equivalent problem involving dividing by a whole number.

$$\begin{array}{l} 0.12 \overline{)1.44} \rightarrow 12 \overline{)144} \\ 0.03 \overline{)1.5} \rightarrow 3 \overline{)150} \\ 0.18 \overline{)36} \rightarrow 18 \overline{)3600} \end{array}$$

Work several more examples together.

Dividing by Hundredths

Louis is cutting pieces of rope so the class can practise tying knots. He is cutting the rope into 0.55 m lengths. He has 13.2 m of rope.

How many pieces will he have?

$$13.2 \div 0.55 = ?$$

$$\frac{13.2}{0.55} = \frac{13.2 \times 100}{0.55 \times 100} = \frac{1320}{55}$$

Multiply the divisor and dividend by 100.

Divide

Check.

$$0.55 \overline{)13.2}$$

$$0.55 \overline{)13.20}$$

$$\begin{array}{r} 24 \\ 55 \overline{)1320} \\ -110 \\ \hline 220 \\ -220 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 24 \\ \times 0.55 \\ \hline 120 \\ 120 \\ \hline 13.20 \end{array}$$

Louis will have 24 pieces of rope.



EXERCISES

Multiply each number by 100.

- 30 **3000**
- 3 **300**
- 0.3 **30**
- 0.03 **3**
- 0.003 **0.3**
- 0.4 **40**
- 0.04 **4**
- 0.004 **0.4**
- 18 **180**
- 21.43 **2143**

Divide.

- $0.02 \overline{)6}$ **300**
- $0.08 \overline{)32}$ **400**
- $0.12 \overline{)48}$ **400**
- $0.25 \overline{)375}$ **1500**
- $0.03 \overline{)3.6}$ **120**
- $0.04 \overline{)8.4}$ **210**
- $0.15 \overline{)7.5}$ **50**
- $0.23 \overline{)46}$ **20**
- $0.04 \overline{)0.24}$ **6**
- $0.05 \overline{)1.25}$ **25**
- $0.13 \overline{)0.39}$ **3**
- $0.41 \overline{)1.64}$ **4**
- $0.05 \overline{)0.355}$ **7.1**
- $0.06 \overline{)4.266}$ **71.1**
- $0.16 \overline{)0.048}$ **0.3**
- $0.33 \overline{)0.165}$ **0.5**
- $0.16 \overline{)9}$ **56.25**
- $0.32 \overline{)7.8}$ **24.375**
- $0.95 \overline{)1.634}$ **1.72**
- $0.77 \overline{)66.99}$ **87**

Using the Exercises

- Questions 1 to 10 provide practice in multiplying by 100. Point out the sequence in the first row (questions 1 to 5) and in the first three problems in row 2 (questions 6 to 8). Provide more mixed practice if the students need it.
- In questions 11 to 26, each row of questions has a different type of dividend. Check the moving of the decimal point for each type.
- Questions 27 to 30 are mixed practice.

PRACTICE

Find the quotient.

1. $0.02 \overline{)0.6}$ 2. $0.04 \overline{)76}$ 3. $0.05 \overline{)1.35}$ 4. $0.06 \overline{)3.132}$
5. $0.04 \overline{)0.008}$ 6. $0.04 \overline{)59.2}$ 7. $0.05 \overline{)871.5}$ 8. $0.08 \overline{)29.36}$
9. $0.12 \overline{)384}$ 10. $0.14 \overline{)5.88}$ 11. $0.09 \overline{)847.8}$ 12. $0.92 \overline{)110.4}$

Divide. Check the answer.

13. $0.23 \overline{)0.575}$ $\overset{25}{}$ 14. $0.56 \overline{)1.12}$ $\overset{2}{}$ 15. $0.23 \overline{)0.92}$ $\overset{4}{}$ 16. $0.17 \overline{)8.5}$ $\overset{50}{}$

17. $0.32 \overline{)7.68}$ $\overset{24}{}$ 18. $1.4 \overline{)11.2}$ $\overset{8}{}$ 19. $0.52 \overline{)0.208}$ $\overset{04}{}$ 20. $0.18 \overline{)9}$ $\overset{50}{}$

21. $2.52 \div 21$ 0.12 22. $37.6 \div 0.08$ 470 23. $0.21 \div 1.1$ 0.191

24. $7 \div 0.05$ 140 25. $14.4 \div 0.06$ 240 26. $3.38 \div 0.26$ 13

Solve.

27. Alf is buying strips of balsa wood to make model airplanes. A one-metre strip sells for \$0.89. How much wood can he buy for \$22.25? **25 strips**
28. A 4.5 kg package of birdseed usually lasts for 18 weeks. The store only has 3 kg packages. How long should the 3 kg package last? **12 weeks**

Missing Digits

Copy and complete the division.

ion.

$$\begin{array}{r} 0.28 \\ 0. \overline{) 1.48} \\ \underline{- 1.40} \\ 8 \\ 8 \\ \underline{- 8} \\ 0 \end{array}$$

231

Assigning the Practice

Minimum: 1-8, 17-23

Average: 5-23, 27

Enriched: 17-28

Reinforcement

1. Ask the students to multiply each of the following numbers by 100.

- | | | | |
|----------------|-----------------|------------------|-----------------|
| a. 5 | b. 16 | c. 1.8 | d. 43.29 |
| e. 7.1 | f. 85.37 | g. 27.381 | h. 230 |
| i. 49 | j. 1049 | k. 0.2 | l. 0.13 |
| m. 9.35 | n. 38.4 | o. 0.01 | p. 0.413 |

Ask them to write and solve a division question in which it would be necessary to multiply each of the above numbers by 100.

2. Divide.

a. $9\overline{)99999}$ $0.9\overline{)99999}$ $0.09\overline{)99999}$

b. $9\overline{)99.999}$ $0.9\overline{)99.999}$ $0.09\overline{)99.999}$

Enrichment

Assign *Missing Digits* at the bottom of page 231.

Extra Practice

Worksheet A55

Pages 230-231

Divide.

1. $0.04 \overline{)28}$ 2. $0.36 \overline{)828}$ 3. $1.65 \overline{)11.55}$ 4. $0.03 \overline{)4.2}$
5. $2.43 \overline{)85.05}$ 6. $0.72 \overline{)496.8}$ 7. $3.05 \overline{)335.5}$ 8. $0.24 \overline{)7.92}$
9. $0.67 \overline{)85}$ 10. $0.02 \overline{)3.7}$ 11. $0.56 \overline{)1.4}$ 12. $1.24 \overline{)12}$

Solve.

- Zena bought some candy bars for \$2.45. Each bar costs \$0.35. How many bars did she buy? **7**
- Jonathan can run 0.87 m/s. How long would it take him to run 65.25 m?

75 s

Objective A56

Divide a whole number or a decimal by a whole number or a decimal in tenths or hundredths, with remainders. Round the quotient to the nearest tenth or hundredth.

Introducing the Lesson

Write two lists of numbers on the chalkboard and review rounding to the nearest tenth and nearest hundredth. Ask students for the two rules for rounding. *If the next digit is less than 5, don't change the prior digit. If the next digit is 5 or more, round up.*

Examples:

2.354 → 2.35 to the nearest hundredth
→ 2.4 to the nearest tenth

Teaching the Lesson

Read together the word problem in the lesson example on page 232. Then write the problem $6 \overline{)1.55}$ on the chalkboard and work it with the students up to the point of the last remainder.

$$\begin{array}{r} 0.25 \\ 6 \overline{)1.55} \\ \underline{12} \\ 35 \\ \underline{30} \\ 5 \end{array}$$

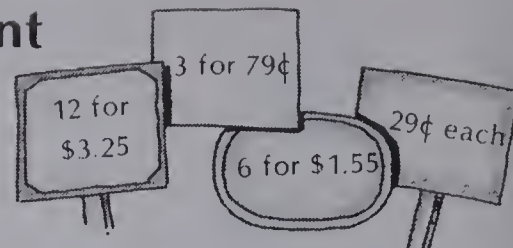
Point out that the answer is to be in cents without a remainder.

Tell the students that if we could divide one more time, so that the quotient is in thousandths, we could round to hundredths (cents). Remind students that adding a zero at the end of a decimal does not change its value. Add a zero to the dividend and divide again. Discuss the rounding of the quotient. In 0.258, $8 > 5$. So, 0.258 is rounded **up** to 0.26.

Do several more similar examples, until the students are sure of the procedure.

Rounding the Quotient

Marikka checked various stores to compare prices of grapefruit. She calculated the price of **one** grapefruit in each store. Frederick's Market had the best buy at 6 for \$1.55. What was the price of one grapefruit at Frederick's?



Divide

$$\begin{array}{r} 0.258 \\ 6 \overline{)1.550} \\ \underline{-12} \\ 35 \\ \underline{-30} \\ 50 \\ \underline{-48} \\ 2 \end{array}$$

Round to the nearest hundredth.

0.26

Grapefruit are about 26¢ each at Frederick's.

EXERCISES

Round to the nearest hundredth.

1. 0.378 **0.38**
2. 1.4251 **1.43**
3. 67.043 **67.04**
4. 0.019 **0.02**
5. 6.4222 **6.42**
6. 0.666 **0.67**
7. 1.414 **1.41**
8. 29.395 **29.40**

Divide. Round the quotient to the nearest hundredth.

9. $7 \overline{)1}$ **0.14**
10. $9 \overline{)1}$ **0.11**
11. $11 \overline{)1}$ **0.09**
12. $13 \overline{)1}$ **0.08**
13. $3 \overline{)0.1}$ **0.03**
14. $6 \overline{)0.4}$ **0.07**
15. $15 \overline{)0.35}$ **0.02**
16. $23 \overline{)6.247}$ **0.27**
17. $0.3 \overline{)16}$ **53.33**
18. $0.9 \overline{)2.9}$ **3.22**
19. $0.14 \overline{)0.51}$ **3.64**
20. $0.36 \overline{)7.318}$ **20.33**

Divide. Round the quotient to the nearest tenth.

21. $3 \overline{)2}$ **0.7**
22. $17 \overline{)1}$ **0.1**
23. $0.6 \overline{)0.1}$ **0.2**
24. $0.15 \overline{)1.072}$ **7.1**

Using the Exercises

- Questions 1 to 8 provide practice in rounding to the nearest hundredth. If you feel the students need practice in rounding to the nearest tenth, ask them to round these numbers to the nearest tenth before doing questions 21 to 24.
- Help students to put the decimal point in the dividend in questions 9 to 12. Discuss how many zeros must be added to have a quotient in thousandths. 3. Discuss why the quotient must be in thousandths. *In order to round to hundredths.*
- Questions 13 to 20 provide mixed practice. Provide help where necessary.
- Questions 21 to 24 involve rounding to the nearest tenth. Discuss how many decimal places are needed in the quotient to round to tenths. *Two decimal places.*

PRACTICE

Divide. Round the quotient to the nearest tenth.

1. $8 \overline{)150}$ 18.8
2. $6 \overline{)1.3}$ 0.2
3. $5 \overline{)0.59}$ 0.1
4. $4 \overline{)0.235}$ 0.1
5. $0.7 \overline{)237}$ 338.6
6. $0.5 \overline{)4.3}$ 8.6
7. $0.3 \overline{)0.35}$ 1.2
8. $0.06 \overline{)0.017}$ 0.3

Divide. Round the quotient to the nearest hundredth.

9. $23 \overline{)342}$ 14.87
10. $3.4 \overline{)413}$ 121.47
11. $48 \overline{)2.9}$ 0.06
12. $12 \overline{)1}$ 0.08
13. $15 \overline{)0.2}$ 0.01
14. $1.6 \overline{)0.35}$ 0.22
15. $0.08 \overline{)0.131}$ 1.64
16. $0.25 \overline{)6}$ 24.00
17. $0.4 \overline{)0.213}$ 0.53
18. $0.7 \overline{)1.5}$ 2.14
19. $1.9 \overline{)2}$ 1.05
20. $0.13 \overline{)4.6}$ 35.38

Solve.

21. Twelve marbles have a mass of 70 g. What is the mass of one marble to the nearest tenth of a gram? 5.8 g
22. What is the better buy for oranges — 12 for \$1.69 or 14¢ each?
23. A candle mold holds 0.18 L of wax. How many candles can you make with 3 L of wax? 16.7

USING THE CALCULATOR

Estimate each quotient mentally.

Then divide on a calculator.

Round the quotients to the nearest thousandth.

1. $0.54 \div 0.7$ 0.771
2. $6.98 \div 0.3$ 23.267
3. $75.25 \div 0.9$ 83.611
4. $68 \div 0.77$ 88.312
5. $85.4 \div 0.33$ 258.788
6. $69.22 \div 0.54$ 128.185
7. $9 \div 1.54$ 5.844
8. $55.2 \div 6.35$ 8.693
9. $8 \div 0.127$ 62.992

Find the differences between your estimates and the calculations.

You win the challenge if the sum of your differences is less than 100.

233

Assigning the Practice

Minimum: 1-12

Average: 1-16, 21-22

Enriched: 5-8, 17-23

Reinforcement

1. Assign *Using the Calculator* on the bottom of page 233, but ask the students to round the answers to the nearest hundredth.

2. Ask the students to estimate the quotients for problems 1 to 8 in the Extra Practice.

Enrichment

1. Assign *Using the Calculator* at the bottom of page 233.

2. Which of the following quotients is about 30?

- a. $0.6 \overline{)182.4}$ b. $4.3 \overline{)142.76}$ c. $6.3 \overline{)257.93}$

3. Which of the following quotients is about 50?

- a. $4.5 \overline{)234}$ b. $4.5 \overline{)23.4}$ c. $4.5 \overline{)2340}$

Extra Practice

Worksheet A56

Pages 232-233

Divide. Round to the nearest hundredth.

1. $3 \overline{)0.8}$ 0.27
2. $6 \overline{)7.7}$ 1.28
3. $0.8 \overline{)5.21}$ 6.51
4. $0.5 \overline{)0.133}$ 0.27
5. $0.6 \overline{)7}$ 11.67
6. $4.3 \overline{)80}$ 18.60
7. $7 \overline{)4.39}$ 0.63
8. $9 \overline{)0.3}$ 0.03
9. $25 \overline{)2}$ 0.08
10. $0.04 \overline{)9}$ 225.00
11. $0.03 \overline{)5.2}$ 173.33
12. $0.01 \overline{)1.01}$ 101.00
13. $8 \overline{)0.1}$ 0.01
14. $0.6 \overline{)0.13}$ 0.22
15. $5 \overline{)0.01}$ 0.00
16. $0.12 \overline{)3.141}$ 26.18

Solve. Round the answer to the nearest hundredth.

17. Sam earns \$35 a day. He works 8 h. About how much does he earn per hour? $\$4.38$
18. An airplane travelled 1299.5 km in 3 h. How far did it travel each hour? 433.17 km

Objective A57

Express a fraction as a decimal; round the quotient to the nearest tenth or hundredth.

Introducing the Lesson

Review writing fractions as decimals by using fractions that are easily converted.

$$\begin{array}{ll} \frac{1}{10} = 0.1 & \frac{3}{100} = 0.03 \\ \frac{26}{100} = 0.26 & \frac{7}{10} = 0.7 \\ \frac{1}{2} = \frac{5}{10} = 0.5 & \frac{1}{4} = \frac{25}{100} = 0.25 \\ \frac{3}{20} = \frac{15}{100} = 0.15 & \frac{3}{4} = \frac{75}{100} = 0.75 \end{array}$$

Teaching the Lesson

Ask the students for different ways to write “three divided by twenty”. They should suggest at least:

$$20 \overline{)3} \quad 3 \div 20$$

They may also suggest $\frac{3}{20}$. To make the students aware of this possibility, call the students’ attention to the division symbol \div . Write it on the chalkboard with very firm dots. Enlarge the dots until they form digits.

$$\div \rightarrow \frac{\bullet}{\bullet} \rightarrow \frac{2}{5}$$

Note that a fraction is really an expression of division. $\frac{2}{5}$ is “2 divided by 5”.
 \div (divided by) $\frac{2}{5}$ (2 divided by 5)

Ask the students to prove this.

$$\frac{2}{5} = \frac{4}{10} = 0.4 \quad 5 \overline{)2.0}$$

Ask the students to change $\frac{3}{4}$ to a decimal by dividing 3 by 4.

Read the lesson example on page 234 together. Call attention to the adding of three zeros in the dividend.

Expressing Fractions as Decimals

Jennifer likes to use decimals instead of fractions when she uses her calculator. What decimal would she use in a problem that involves multiplying by $\frac{3}{8}$?



$$8 \overline{)3}$$

To change a fraction to a decimal, divide the numerator by the denominator

$$\begin{array}{r} 0.375 \\ 8 \overline{)3.000} \\ \underline{-24} \\ 60 \\ \underline{-56} \\ 40 \\ \underline{-40} \\ 0 \end{array}$$



$$\frac{3}{8} = 0.375$$

EXERCISES

Express the fraction as a decimal.

Divide until the remainder is zero.

1. $\frac{1}{2}$ **0.5** 2. $\frac{1}{4}$ **0.25** 3. $\frac{3}{4}$ **0.75** 4. $\frac{1}{5}$ **0.2** 5. $\frac{2}{5}$ **0.4**
6. $\frac{3}{5}$ **0.6** 7. $\frac{4}{5}$ **0.8** 8. $\frac{1}{8}$ **0.125** 9. $\frac{5}{8}$ **0.625** 10. $\frac{7}{8}$ **0.875**
11. $\frac{1}{20}$ **0.05** 12. $\frac{3}{20}$ **0.15** 13. $\frac{9}{20}$ **0.45** 14. $\frac{11}{20}$ **0.55** 15. $\frac{19}{20}$ **0.95**
16. $\frac{1}{25}$ **0.04** 17. $\frac{9}{25}$ **0.36** 18. $\frac{17}{25}$ **0.68** 19. $\frac{1}{50}$ **0.02** 20. $\frac{23}{50}$ **0.46**

Express the fraction as a decimal to the nearest tenth.

21. $\frac{5}{8}$ **0.6** 22. $\frac{1}{3}$ **0.3** 23. $\frac{2}{15}$ **0.1** 24. $\frac{4}{7}$ **0.6** 25. $\frac{7}{9}$ **0.8**

Express the fraction as a decimal to the nearest hundredth.

26. $\frac{2}{3}$ **0.67** 27. $\frac{7}{8}$ **0.88** 28. $\frac{5}{9}$ **0.56** 29. $\frac{1}{14}$ **0.07** 30. $\frac{5}{6}$ **0.83**

Using the Exercises

- Note the progression in questions 1 to 20. For each new denominator, the fractions in that set increase in value. Watch that students place the decimal point correctly and that they write a zero in the ones place in the quotient.
- Discuss the number of places needed in the quotient in questions 21 to 25 to round to the nearest tenth.
- Discuss the number of places needed in the quotient in questions 26 to 30 to round to the nearest hundredth.

PRACTICE

Express the fraction as a decimal. Divide until the remainder is zero.

1. $\frac{1}{20}$ **0.05** 2. $\frac{3}{25}$ **0.12** 3. $\frac{3}{50}$ **0.06** 4. $\frac{7}{8}$ **0.875** 5. $\frac{29}{50}$ **0.58**
6. $\frac{4}{25}$ **0.16** 7. $\frac{1}{16}$ **0.0625** 8. $\frac{3}{2}$ **1.5** 9. $\frac{6}{5}$ **1.2** 10. $\frac{11}{8}$ **1.375**

Express the fraction as a decimal to the nearest tenth.

11. $\frac{1}{9}$ **0.1** 12. $\frac{3}{7}$ **0.4** 13. $\frac{3}{8}$ **0.4** 14. $\frac{1}{6}$ **0.2** 15. $\frac{2}{11}$ **0.2**

Express the fraction as a decimal to the nearest hundredth.

16. $\frac{1}{15}$ **0.07** 17. $\frac{1}{30}$ **0.03** 18. $\frac{37}{60}$ **0.62** 19. $\frac{7}{11}$ **0.64** 20. $\frac{5}{18}$ **0.28**

Complete these inequations using $>$ or $<$. Use decimals to help.

21. $\frac{9}{8}$ **$>$** $\frac{12}{11}$ 22. $\frac{7}{4}$ **$<$** $\frac{28}{15}$ 23. $\frac{65}{50}$ **$<$** $\frac{4}{3}$
24. $\frac{8}{29}$ **$>$** $\frac{3}{11}$ 25. $\frac{5}{14}$ **$<$** $\frac{17}{47}$ 26. $\frac{9}{13}$ **$>$** $\frac{24}{35}$

Solve.

27. Mario got 21 right answers out of 25 and Jean got 29 out of 35. Who got the better score? **Mario**
28. $\frac{22}{7}$ is sometimes used as an approximate value for π .
What is $\frac{22}{7}$ to the nearest hundredth? **3.14**

Decimal Designs

Express each fraction as a decimal. Divide until you have four decimal places in the quotient. Do not round.

- a. $\frac{1}{9}$ **0.1111** b. $\frac{2}{9}$ **0.2222** c. $\frac{3}{9}$ **0.3333** d. $\frac{4}{9}$ **0.4444** e. $\frac{5}{9}$ **0.5555**

Notice the pattern. Write the decimal for $\frac{6}{9}$, $\frac{7}{9}$, $\frac{8}{9}$.
0.6666, 0.7777, 0.8888

Express these fractions as decimals. Divide until you have four decimal places. Do not round.

- f. $\frac{1}{11}$ **0.6909** g. $\frac{2}{11}$ **0.1818** h. $\frac{3}{11}$ **0.2727** i. $\frac{4}{11}$ **0.3636** j. $\frac{5}{11}$ **0.4545**

Now write the decimal for $\frac{6}{11}$, $\frac{7}{11}$, $\frac{8}{11}$, $\frac{9}{11}$, $\frac{10}{11}$.
0.5454, 0.6363, 0.7272, 0.8181, 0.9090 235

Assigning the Practice

Minimum: 1-5, 11-20

Average: 1-23, 27

Enriched: 16-28

Reinforcement

1. Assign *Decimal Designs* on the bottom of page 235.

2. Divide the students into teams. Have several sheets of paper ready with exercises in changing fractions to decimals. Give a sheet to the first member of each team. At a signal, a relay race begins. The first student in each team goes to the chalkboard and works the first exercise and then gives the sheet to the second student who does the second exercise, and so on. If a mistake is made, the team has to start over.

Enrichment

1. Ask the students to investigate the meaning of baseball players' batting averages. A batting average is the ratio of the number of hits to the number of times at bat. When this ratio is divided, it is rounded to the nearest thousandth. Ask the students to give several examples of how their favourite players' averages were rounded.

2. $\frac{1}{3} = 0.33\dot{3}$

The dot above the last 3 means that the threes repeat forever. Have the students write two other fractions in this form.

Extra Practice

Worksheet A57

Pages 234-235

Express the fraction as a decimal. Divide until there is no remainder.

1. $\frac{4}{5}$ **0.8** 2. $\frac{3}{2}$ **1.5** 3. $\frac{3}{8}$ **0.375** 4. $\frac{5}{4}$ **1.25** 5. $\frac{9}{25}$ **0.36**
6. $\frac{2}{3}$ **0.66...** 7. $\frac{1}{16}$ **0.0625** 8. $\frac{2}{7}$ **0.285...** 9. $\frac{2}{19}$ **0.105...** 10. $\frac{5}{11}$ **0.454...**

Solve.

1. Jack's allowance is $\frac{5}{6}$ of Jill's. What decimal part is this? **0.833...**
2. Ria can run $\frac{4}{3}$ as fast as Jon. How many times faster is this?
Round to the nearest tenth. **1.3**

UNIT 10 LESSON 10

Objective PS11

Solve problems using a *Guess and Check* strategy.

Introducing the Lesson

Introduce the **is not equal to** symbol \neq by showing the use of the slash to mean “no” in other symbols.



Have the students write the equal sign and then write it with the slash. Ask them to read each symbol.

$=$ is equal to \neq is not equal to

Teaching the Lesson

Read together the lesson example on page 236. Discuss the problem solving strategy. Tell the students that they can sometimes solve problems that are too difficult to solve directly by simply trying reasonable answers. For the lesson example, take any two numbers that satisfy the first condition (one number is 3 times as big as the other) and see if they also satisfy the second condition (if you add 5 to each, one number will be twice as big as the other). The students will like the puzzle nature of this approach.

Problem Solving



Julio is three times as old as Rosa. In five years, he will be only two times as old.

How old are Julio and Rosa now?

If you are not sure where to begin, choose two reasonable numbers and test them.

Guess: **30** and **10** Test: In five years, they will be 35 and 15.
But $2 \times 15 \neq 35$.

Guess: **21** and **7** Test: In five years, they will be 26 and 12.
But $2 \times 12 \neq 26$. (**But** — it's closer.)

Guess: **15** and **5** Test: In five years, they will be 20 and 10.
 $2 \times 10 = 20$

Julio is 15 years old and Rosa is 5 years old now.

EXERCISES

Solve.

- A number multiplied by itself is 225. What is the number? **15**
 $12 \times 12 = 144$ (too small)
 $20 \times 20 = 400$ (too big)
 $17 \times 17 = 289$ (too big)
- A rectangular field has an area of 48 m^2 and a perimeter of 38 m. What are its dimensions?
 To have an area of 48 m^2 , the dimensions could be 8×6 , or 12×4 , or 16×3 or 48×1 .
 Which of these give a perimeter of 38 m?
- If Larry multiplies his age by 3, adds 6, and divides by 3, the result is 15. How old is Larry? **13**
 Try 8: $8 \times 3 = 24$; $24 + 6 = 30$; $30 \div 3 = 10$
 Try 12: $12 \times 3 = 36$; $36 + 6 = 42$; $42 \div 3 = 14$

236

Using the Exercises

- Work through questions 1 to 3 with the students. Help them to find the conditions stated in the question. Help them, also, to arrange their problem solving in a logical sequence (for example, from “too big” answers to “too small”) to shorten the process of finding the answer.

PRACTICE

Solve.

1. A craft fair charged \$5 admission for adults and \$2 for children. For the first 150 people admitted, the proceeds were \$600. How many of these people were adults and how many were children?
100 adults, 50 children
2. Three years ago, Beth was 3 times as old as Ian. Now she is 8 years older than Ian. How old are Beth and Ian now?
15 and 7
3. I am thinking of a number. If I triple it and then subtract 8, the result is 13. What is the number?
7
4. Nicole has 8 coins in her purse. They total \$1.15. How many quarters, dimes, and nickels does she have?
3 quarters, 3 dimes, 2 nickels
5. A rectangular garden has an area of 36 m^2 and a perimeter of 30 m. What are its dimensions?
12 m 3 m

REVIEW

- A53 Divide.
1. $8 \overline{)0.16}$ **0.02**
 2. $12 \overline{)3.6}$ **0.3**
 3. $5 \overline{)1.245}$ **0.249**
- A54
4. $0.4 \overline{)96}$ **240**
 5. $0.3 \overline{)0.057}$ **0.19**
 6. $2.7 \overline{)0.81}$ **0.3**
- A55
7. $0.05 \overline{)8715}$ **174.30**
 8. $0.13 \overline{)0.78}$ **6**
 9. $0.33 \overline{)165}$ **5**
- A56 Divide. Round the quotient to the nearest hundredth.
10. $14 \overline{)0.2}$ **0.01**
 11. $2.6 \overline{)0.371}$ **0.14**
 12. $0.09 \overline{)12}$ **133.33**
- A57 Express the fraction as a decimal.
Divide until the remainder is zero.
13. $\frac{5}{8}$ **0.625**
 14. $\frac{9}{36}$ **0.25**
 15. $\frac{7}{5}$ **1.4**

237

Assigning the Practice

Minimum: 1-5

Average: 1-5

Enriched: 1-5

Review Exercises

Questions	Objective	Pages
1-3	A53	226-227
4-6	A54	228-229
7-9	A55	230-231
10-12	A56	232-233
13-15	A57	234-235

Reinforcement

Ask the students to describe their strategies for solving the problems in the Practice or the Extra Practice.

Enrichment

Ask the students to make up their own "I am thinking of a number" puzzles, as in question 3 of the Practice. Students exchange puzzles and solve them.

Extra Practice

Worksheet PS11

Pages 236-237

Solve.

1. A decimal in tenths multiplied by itself is 11.56. What is the number?
3.4
2. Red Hots are 27¢ and Cool Cats are 35¢. Susan bought some of each. The total cost was \$2.56. How many of each did she buy?
3 RH + 5 CC
3. Abraham is $\frac{1}{4}$ as old as Louis. Next year he will be $\frac{1}{3}$ as old. How old are Abraham and Louis now?
Abraham 2, Louis 8
4. Joe has 10 coins that total 40¢. What coins does he have?
5 pennies, 3 nickels, 2 dimes
5. Rita has 45 customers on her paper route. Some only take the paper on Saturday and pay 50¢. Others take the paper daily and pay \$2.00 a week. Last week Rita collected \$67.50. How many Saturday customers and how many daily customers does she have?
30 daily 15 Saturday only

Problem Solving Activities

Assign Level 6, Unit 10

Unit 10 Objectives	Test Questions	Pages
N20	1-4	218-219
A50	5-8	220-221
A51	9-12	222-223
A52	13-16	224-225
A53	17-19	226-227
A54	20-22	228-229
A55	23-25	230-231
A56	26-28	232-233
A57	29-32	234-235
PS	33	

TEST

UNIT 10

What is the reciprocal?

1. $\frac{1}{5}$ 5 2. $\frac{2}{3}$ $\frac{3}{2}$ 3. $6\frac{1}{6}$ 4. $\frac{1}{10}$ 10

Divide.

5. $\frac{5}{9} \div 3$ $\frac{5}{27}$ 6. $\frac{2}{3} \div 2$ $\frac{1}{3}$ 7. $\frac{1}{4} \div 3$ $\frac{1}{12}$ 8. $\frac{3}{8} \div 2$ $\frac{3}{16}$
9. $5 \div \frac{1}{2}$ 10 10. $\frac{1}{4} \div \frac{1}{3}$ $\frac{3}{4}$ 11. $\frac{5}{6} \div \frac{1}{4}$ $3\frac{1}{3}$ 12. $6 \div \frac{1}{8}$ 48
13. $\frac{1}{3} \div \frac{3}{4}$ $\frac{4}{9}$ 14. $7 \div \frac{2}{5}$ $17\frac{1}{2}$ 15. $2\frac{1}{2} \div \frac{3}{8}$ $6\frac{2}{3}$ 16. $\frac{5}{6} \div \frac{3}{5}$ $1\frac{7}{18}$
17. $8 \overline{)0.8}$ 0.1 18. $4 \overline{)17.2}$ 4.3 19. $5 \overline{)2.95}$ 0.59
20. $0.6 \overline{)18}$ 30 21. $0.4 \overline{)0.72}$ 1.8 22. $12 \overline{)0.084}$ 0.07
23. $0.05 \overline{)0.455}$ 9.1 24. $0.07 \overline{)2.8}$ 40 25. $0.16 \overline{)6.56}$ 41

Divide. Round the quotient to the nearest hundredth.

26. $0.8 \overline{)2.9}$ 3.63 27. $9 \overline{)2}$ 0.22 28. $1.7 \overline{)0.98}$ 0.58

Express the fraction as a decimal.

Divide until the remainder is zero.

29. $\frac{7}{8}$ 0.875 30. $\frac{7}{50}$ 0.14 31. $\frac{4}{5}$ 0.8 32. $\frac{28}{25}$ 1.12

Solve.

33. Apples cost 18¢ each and oranges cost 21¢ each. Kim bought 7 pieces of fruit for \$1.32. How many apples and how many oranges did she buy?

5 apples, 2 oranges.

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Post-test

Unit 10

What is the reciprocal?

1. $\frac{1}{3}$ 3 2. $\frac{3}{4}$ $\frac{4}{3}$ 3. $16\frac{1}{16}$ 4. $\frac{1}{9}$ 9

Divide.

5. $\frac{1}{2} \div 3$ $\frac{1}{6}$ 6. $\frac{3}{4} \div 6$ $\frac{1}{8}$ 7. $\frac{5}{8} \div 3$ $\frac{5}{24}$ 8. $\frac{8}{9} \div 4$ $\frac{2}{9}$
9. $3 \div \frac{1}{2}$ 6 10. $\frac{2}{3} \div \frac{1}{3}$ 2 11. $8 \div \frac{1}{4}$ 32 12. $\frac{5}{8} \div \frac{1}{3}$ $1\frac{7}{8}$
13. $\frac{1}{3} \div \frac{5}{6}$ $\frac{2}{5}$ 14. $6 \div \frac{3}{4}$ 8 15. $2\frac{1}{4} \div \frac{2}{3}$ $3\frac{3}{8}$ 16. $\frac{2}{3} \div \frac{5}{6}$ $\frac{4}{5}$
17. $9 \overline{)0.9}$ 0.1 18. $3 \overline{)14.1}$ 4.7 19. $8 \overline{)4.32}$ 0.54
20. $0.5 \overline{)35}$ 70 21. $0.4 \overline{)1.44}$ 3.6 22. $2.5 \overline{)0.125}$ 0.05

Solve.

1. 3 cans cost \$12.24. What is the cost per can? **\$ 4.08**
2. Tom ran 2000 m in 10 min. What is his speed in metres per minute? **200 m/min.**
3. 1 L costs \$2.95. What do 6 L cost? **\$ 17.70**
4. At 180 km in 3 h, how far would a bicycle travel in 6 h? **360 km**

Write a ratio to compare these numbers of objects.

5. 8 books to 5 students **8:5**
6. 3 bananas to 5 plums **3:5**
7. 12 patients to 2 doctors **12:2**
8. 11 beans to 6 radishes **11:6**

Find the value of N .

9. $\frac{6}{7} = \frac{N}{28}$ **24**
10. $\frac{4}{9} = \frac{20}{N}$ **45**
11. $\frac{5}{11} = \frac{45}{N}$ **99**
12. $\frac{8}{N} = \frac{64}{72}$ **9**

Write the equivalent decimal and percent.

13. $\frac{27}{100}$ **0.27** **27%**
14. $\frac{49}{100}$ **0.49** **49%**
15. $\frac{2}{100}$ **0.02** **2%**
16. $\frac{109}{100}$ **1.09** **109%**

Write the equivalent percent.

17. $\frac{19}{25}$ **76%**
18. $\frac{1}{20}$ **5%**
19. $\frac{7}{20}$ **35%**
20. $\frac{39}{50}$ **78%**

Write an equivalent fraction in simplest terms.

21. 5% **$\frac{1}{20}$**
22. 32% **$\frac{8}{25}$**
23. 85% **$\frac{17}{20}$**
24. 60% **$\frac{3}{5}$**

Calculate.

25. 7% of 600 **42**
26. 36% of 175 **63**
27. 65% of \$420 **273**

Solve.

28. 5 bars of soap cost \$1.95. How much will 7 cost? **\$ 2.73**
29. Ann spelled 37 out of 50 words correctly on a test. What percent of the words did she spell correctly? **74%**

23. $0.06 \overline{)0.438}$ **7.3**
24. $0.09 \overline{)3.78}$ **42**
25. $0.18 \overline{)0.648}$ **3.6**

Divide. Round the quotient to the nearest hundredth.

26. $0.3 \overline{)4.1}$ **13.67**
27. $9 \overline{)7}$ **0.78**
28. $4.6 \overline{)10.63}$ **2.31**

Express the fraction as a decimal. Divide until the remainder is zero.

29. $\frac{5}{8} = \underline{0.625}$
30. $\frac{3}{25} = \underline{0.12}$
31. $\frac{19}{20} = \underline{0.95}$
32. $\frac{81}{50} = \underline{1.62}$

Solve.

33. Kim is $\frac{2}{3}$ as old as Keith. In four years, she will be $\frac{3}{4}$ as old as Keith. How old are Kim and Keith now? **Kim is 8.**
Keith is 12.

UNIT 11

Applications

Theme: People

Lesson		Objective	Pages
Preview		Read data from charts and solve problems involving rounding and estimation.	241
1	A58	Find the range and the mode.	242-243
2	A59	Find the mean.	244-245
3	A60	Find the median.	246-247
4	GR1	Read and construct bar graphs.	248-249
5	GR2	Read and construct line graphs.	250-251
6	M14	Identify angles and use the terms vertex, right angle, straight angle, perpendicular, acute, and obtuse.	252-253
7	M15	Measure angles in degrees.	254-255
8	GR3	Read and construct circle graphs.	256-257
9	GR4	Read and write coordinates.	258-259
10	PS12	Solve problems by analogies with simpler problems.	260-261
Test		Applications	262
Review		Division with fractions and decimals	263

About This Unit

George Polya, a leading advocate of the importance of problem solving, has written:

“One of the first and foremost duties of the teacher is *not* to give his/her students the impression that mathematical problems have little connection with each other, and no connection at all with anything else.”

In this unit, the students will have the opportunity to apply many of their previously learned mathematical skills and concepts to real-life situations. They will collect and study data and then describe it in terms of the mean, median, or mode. They will also illustrate data with bar, line, or circle graphs.

Students will utilize concepts from several earlier lessons as they learn new concepts. For example, in Lesson 8 students learn how to construct circle graphs which illustrate data. To do this, they must be able to set up fractional parts of a whole, express fractions in simplest terms, multiply fractions by a whole number, and draw angles of a specific size using a protractor.

Even in problem solving, the focus is on the application of easier, previously learned solutions to more difficult situations. In Lesson 10, students are shown how to solve problems by analogies with simpler problems.

In some cases, it may be necessary to spend a few days on a single lesson to ensure that the students reach a complete understanding of the concepts involved.

Ideas

1. Discuss the illustration on the cover of this book. “What kind of survey might the students be making? How are they collecting and recording their data?”
2. Have the students ask their parents which of this unit's topics they use in their day to day work and activities.
3. Ask the students to find examples of the following from newspapers and magazines. Discuss and display them.
 - a. population growth (page 241)
 - b. averages (pages 242-247)
 - c. bar graphs (pages 248-249)
 - d. line graphs (pages 250-251)
 - e. angles (pages 252-255)
 - f. circle graphs (pages 256-257)

UNIT 11

APPLICATIONS



Unit 11 Objective	Test Questions	Pages
A58, A59, A60	1-3	242-247
GR1	4-5	248-249
GR2	6-8	250-251
M14	9-10	252-253
M15	11	254-255
GR3	12	256-257
GR4	13-15	258-259

Pretest

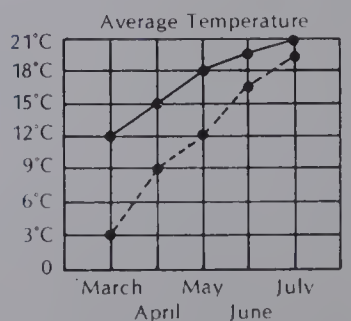
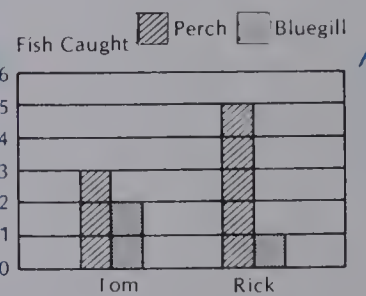
What are the range, mode, mean, and median of each set of numbers?

Round the mean to a whole number, if necessary.

- 32, 38, 27, 25, 30, 30, 29
Range: 13, Mode: 30, Mean: 30
- 416, 400, 416, 416, 405
Range: 16, Mode: 416, Mean: 411
- 18, 24, 18, 20, 17, 21
Range: 7, Mode: 18, Mean: 20

- How many bluegills did Rick catch? *1*
- How many perch were caught in all? *8*

- Which city averages cooler spring weather? *Rock City*
- What is Rock City's average temperature in June? *17°C*
- During which month do the two cities have nearly the same average temperature? *June, July*



Unit 11

Median: 30, 416, 19

Growing Pains



Population of Canada

Year	Population
1851	2 436 297
1871	3 689 257
1891	4 833 239
1911	7 206 643
1931	10 376 786
1951	14 009 429
1961	18 238 247
1971	21 568 311
1976	22 992 604



Use rounded numbers and match questions and answers

- By how much did the population increase from 1851 to 1871? **c**
- The difference in population from 1851 to 1951 was about how much? **a**
- How much is half of the population figure for 1961? **g**
- Double the population figure for 1891 is how much? **f**
- If 2 million is added to the 1976 figure, what will the number be? **d**
- In 1951, Newfoundland was included for the first time. Without Newfoundland, the figure would have been 13 648 006. What was the population of Newfoundland? **j**
- The projected population of Canada in 2001 is 30 655 500. How much more is that than the population in 1976? **h**
- From 1951 to 1961, about 25% of the increase was due to immigration. About how many people was that? **e**

Answers

- 12 000 000
- 46 000 000
- 1 300 000
- 25 000 000
- 1 000 000
- 9 600 000
- 9 000 000
- 8 000 000
- 2 000 000
- 400 000

241

UNIT 11

PREVIEW

Suggestions

Use the illustration on page 240 to begin a discussion on the many different national origins of people who live in Canada. Point out how our lives are enriched by Canadians who have different cultural backgrounds.

About the Page

Discuss the information given in the chart on page 241. Draw attention to the time periods showing a marked increase in population. Ask why this page might be titled "Growing Pains".

Review the rules for rounding whole numbers (Unit 1, Lesson 4, pages 8-9). Ask the students to round the populations given in the chart to the nearest hundred thousand and/or million. Explain that the rounded numbers will be used to answer the questions on page 241.

When rounding large numbers, it is important that the students understand place value. For example, 21 568 311 (the 1971 population of Canada) rounded to the nearest million is 22 000 000, because there is a 5 in the hundred thousands place. In rounding, the millions place stays the same or increases by one. The places to the right of the millions place all become zeros after rounding.

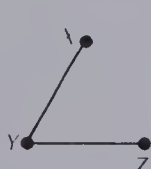
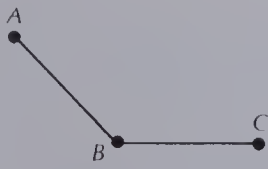
Enrichment

- Have the students use the population chart given on page 241 to write a set of comparison questions for the class to answer.
- Ask the students to research and chart the population growth of various Canadian cities. Display their work.

Name the angle which is:

9. acute

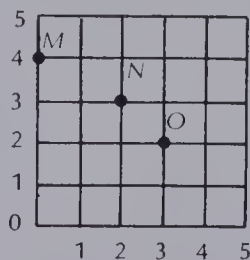
10. right



11. Which angle measures 90°?



12. A parking lot had 8 sedans, 6 station wagons, 3 vans, and 7 convertibles. Make a circle graph to show the cars in the parking lot.



Write the ordered pair for each point.

- M (0,4)
- N (2,3)
- O (3,2)

Objective A58

Find the range and the mode.

Introducing the Lesson

Write the words *football*, *soccer*, *hockey*, *tennis*, and *basketball* on the chalkboard. Ask the students which sport they would watch on TV if they had a choice. Place tally marks beside the sport as the students name their choices. Ask which sport is the most popular, the least popular. Explain that this kind of information is called *statistics*.

Teaching the Lesson

Measure (to the nearest centimetre) the height of each girl student. Then list the heights on the chalkboard from shortest to tallest. Use tally marks to show duplicate heights. Repeat for the boys. Explain that these measurements can also be called *data*.

Ask the shortest and the tallest girls to come to the front of the room. Point out that the **range** in heights (of girls in the class) is the difference between their two heights. Show the class how to calculate the range of the girls' heights. Have the students calculate the range of the boys' heights.

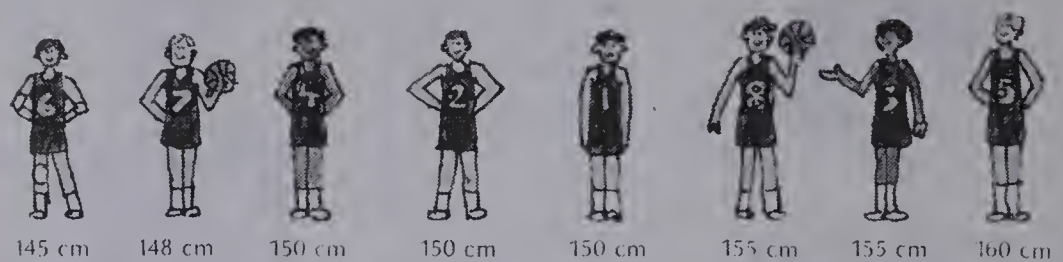
Next, have the students study the lists of heights. Ask, "What height occurs most frequently for the girls? for the boys?" Explain that the number that occurs most frequently is called the **mode**. Point out that the mode is one way of describing an **average** height.

Read and discuss the data given at the top of page 242. Explain how the range is calculated. Ask which height occurs most often. Note that this height is the **mode of the data** or one way of describing the average.

List a set of spelling test scores in order from the lowest to highest on the chalkboard. Use tally marks to show duplicate scores. Have the students determine the range and the mode of this data.

Mode

Heights of Players on the Southdale Basketball Team



The shortest player is 145 cm tall

The tallest player is 160 cm tall.

$$\begin{array}{r} 160 \\ - 145 \\ \hline 15 \end{array}$$

The **range** is 15 cm.

Three of the players are 150 cm tall.

The number that occurs most often is called the **mode**.

The **mode** of the data is 150 cm.

How often do the other heights occur?

EXERCISES

What is the range of the set of numbers? What is the mode?

1. 12, 13, 15, 15, 18

Range: $18 - 12 = \blacksquare 6$

Mode: $\blacksquare 15$

2. 88, 92, 95, 95, 95

Range: $95 - 88 = \blacksquare 7$

Mode: $\blacksquare 95$

3. 10 cm, 10 cm, 12 cm, 14 cm, 15 cm, 16 cm

Range: $\blacksquare 6 \text{ cm}$ Mode: $\blacksquare 10 \text{ cm}$

4. 22°C, 25°C, 25°C, 25°C, 26°C, 28°C, 29°C

Range: $\blacksquare 7^\circ\text{C}$ Mode: $\blacksquare 25^\circ\text{C}$

5. 30 L, 27 L, 30 L, 29 L, 30 L

Range: $\blacksquare 3 \text{ L}$ Mode: $\blacksquare 30 \text{ L}$

6. 120 kg, 131 kg, 131 kg, 167 kg

Range: $\blacksquare 47 \text{ kg}$ Mode: $\blacksquare 131 \text{ kg}$

7. 82 s, 80 s, 76 s, 75 s, 84 s, 97 s, 75 s

Range: $\blacksquare 22 \text{ s}$ Mode: $\blacksquare 75 \text{ s}$

8. 50 m, 55 m, 45 m, 50 m, 40 m, 50 m

Range: $\blacksquare 15 \text{ m}$ Mode: $\blacksquare 50 \text{ m}$

Using the Exercises

- Questions 1 to 8 give small sets of data from which the students are to determine the ranges and modes. The first two questions help the students find the range. For these exercises and those on page 243, it is imperative that the students understand the meanings of the terms **range** and **mode** and their usefulness in describing data.

PRACTICE

What are the range and mode?

1. Heights of Students (cm)

142	139	178	164	167
155	146	150	161	158
173	156	169	149	153
144	170	155	154	157
160	152	165	155	146

Range 39
Mode 155

2. Daily High Temperatures in May (°C)

14	10	13	16	18	19	21	20
18	12	9	12	16	18	23	19
10	11	12	15	14	20	22	23
20	15	14	17	17	19	20	

Range 14 Mode 20

The mode isn't always a number.

What is the mode for each set of data?

Mode 66-74

Mode : M

3. Range of Marks Students

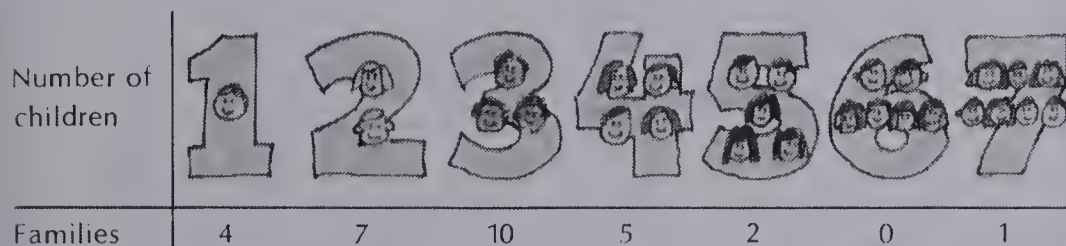
A	75-100	2
B	66-74	15
C	60-65	14
D	50-59	5
E	less than 50	3

4. Shirts Ordered by Size in One Week

Size	Mon.	Tues	Wed.	Thurs	Fri	Sat	TOTAL
S	2	0	3	8	10	12	35
M	3	2	5	7	15	23	55
L	2	2	4	5	12	16	41
XL	1	2	0	4	9	13	29

Family Studies

Southdale's Grade 6 class conducted a survey on the size of students' families.



- How many families have 2 children? 7 children?
- What is the range for the numbers of children? the mode?
- How many families have fewer children than the mode? 11
- How many children are there altogether in all the families? 85
- Can you show how to use a calculator with a memory to solve question 4?

243

Assigning the Practice

Minimum: 1-3

Average: 1-4

Enriched: 1-4

Reinforcement

1. Assign *Family Studies* at the bottom of page 243. After a few days, have those students who know how to use a calculator's memory do question 5 and explain the method to the rest of the class.

2. Have the students measure each other's armspans in centimetres. Then ask them to determine the range and mode of the spans.

3. Have the students list the distance in blocks (or kilometres) they live from school. Then ask them to find the range and the mode.

Enrichment

Make four sets of numeral cards from 0 to 10. Shuffle the cards. Deal five cards to each of three or four players. In turn, the players name the range and the mode of the numbers in his or her hand. If correct, the number of points awarded the player is to be the sum of the mode and range.

2 6 6 8 9 → Mode 6
Range 7
Points 13

(If there is no mode, no points are added to the range.) The winner is the player with the highest score after eight hands.

Extra Practice

Worksheet A58

Pages 242-243

What is the range of the set of numbers?

What is the mode?

- \$20, \$15, \$21, \$24, \$26, \$32, \$21
Range: \$17
Mode: \$21
- 80 m, 78 m, 65 m, 96 m, 80 m, 78 m
Range: 31 m
Mode: 80 m
- 11.0 L, 9.4 L, 10.1 L, 10.1 L, 10.6 L, 10.1 L
Range: 1.6 L
Mode: 10.1 L
- \$2.55, \$3.40, \$3.05, \$3.40, \$3.65, \$3.40
Range: \$1.10
Mode: \$3.40

What are the range and mode of this data?

Monthly Rainfall

Jan. 7 cm	Feb. 6 cm	Mar. 4 cm	April 4 cm	May 8 cm	June 7 cm
July 3 cm	Aug. 2 cm	Sept. 1 cm	Oct. 4 cm	Nov. 4 cm	Dec. 5 cm

Range: 7cm
Mode: 4cm

Objective A59

Find the mean.

Introducing the Lesson

Write the following chart giving information about basketball players on the chalkboard.

Player	Average Points per Game
Tyler	18
Wade	8
Reed	9
Paulo	16
Scott	5

Ask, “What do the numbers mean? Does each player always score the number of points listed? Could Tyler ever score 4 points in a game? Could Scott ever score 19 points?”

Discuss the term **average**. Point out its use in these situations: average rainfall, average temperature, average test score, and average mass.

Teaching the Lesson

Write the class attendance for the past week on the chalkboard.

Mon.	Tues.	Wed.	Thurs.	Fri.
28	27	30	28	32

Ask for the range and the mode for this data. Review that the mode is one way of describing an average. Explain that another way to describe an average is by using the **mean**. Point out that the mean is most frequently used to describe an average. Show the two-step method for calculating the mean.

Step 1:
Add the data. $28 + 27 + 30 + 28 + 32 = 145$

Step 2:
Divide the sum by the number of items.

$$\begin{array}{r} 29 \text{ Mean, or average,} \\ 5 \overline{)145} \text{ attendance} \end{array}$$

Read and discuss the top of page 244. Have a student calculate the mean at the chalkboard.

Have the students compute the mean for the following items.

- a. 6 m, 8 m, 9 m, 12 m, 13 m, 11 m
- b. 46 L, 55 L, 57 L, 63 L

Mean

The chart gives the daily attendance for the first week of May at Beauport School. What was the **mean** daily attendance?



The **mean** for a set of data is found by dividing the sum by the total number of items.

$$\begin{array}{r} 418 \\ 422 \\ 417 \\ 425 \\ + 413 \\ \hline 2095 \end{array} \qquad \begin{array}{r} 419 \\ 5 \overline{)2095} \end{array}$$

The mean daily attendance for the week was 419. The **mean** is what people often call the **average**. Mean and mode are two types of averages.

Attendance	
Month: May	Week: 1
Monday	418
Tuesday	422
Wednesday	417
Thursday	425
Friday	413

EXERCISES

Find the mean.

1. $\begin{array}{r} 8 \\ 9 \\ 7 \\ 10 \\ + 6 \\ \hline \end{array}$

$\square \div 5 = \square$

40 8
2. $\begin{array}{r} 70 \\ 75 \\ 90 \\ + 85 \\ \hline \end{array}$

$\square \div 4 = \square$

320 80
3. $\begin{array}{r} 130 \\ 125 \\ 126 \\ 120 \\ 121 \\ + 122 \\ \hline \end{array}$

$\square \div 6 = \square$

744 124
4. 40, 47, 42, 45, 46

44
5. 120, 128, 130

126

Find the mean. Round to the nearest whole number.

6. $\begin{array}{r} 32 \text{ cm} \\ 41 \text{ cm} \\ 37 \text{ cm} \\ \hline \end{array}$

37
7. $\begin{array}{r} 80 \text{ kg} \\ 73 \text{ kg} \\ 63 \text{ kg} \\ 86 \text{ kg} \\ 76 \text{ kg} \\ \hline \end{array}$

76
8. $\begin{array}{r} 1047 \text{ L} \\ 1212 \text{ L} \\ 1153 \text{ L} \\ 1181 \text{ L} \\ \hline \end{array}$

1148
9. $\begin{array}{r} 18.5 \text{ s} \\ 19.8 \text{ s} \\ 20.2 \text{ s} \\ 19.0 \text{ s} \\ 19.5 \text{ s} \\ \hline \end{array}$

19

Using the Exercises

- Questions 1 to 5 develop the two-step method for calculating the mean. There are no remainders.
- Questions 6 to 9 require rounding to the nearest whole number because the division steps in the calculations of the means do not yield whole numbers.

Find the mean and the range.

1. 20 cm, 18 cm, 17 cm, 10 cm, 23 cm, 17 cm **Mean 17.5 Range 13**
2. 41 kg, 49 kg, 53 kg, 51 kg, 44 kg, 52 kg **48.3 12**
3. 32 m², 60 m², 48 m², 35 m², 56 m², 29 m², 51 m² **44.4 21**
4. 70 L, 39 L, 62 L, 45 L **54 31**
5. 134 km, 205 km, 126 km, 215 km, 163 km **168.6 89**

Find the mean. How many numbers are greater than the mean?

How many numbers are less than the mean?

6. 10°C, 11°C, 14°C, 12°C, 13°C **Mean 12 Greater 2 Less 2**
7. 62 mm, 60 mm, 60 mm, 65 mm, 63 mm, 68 mm **Mean 63 Greater 2 Less 2**
8. 110 t, 115 t, 105 t, 102 t **Mean 108 Greater 2 Less 2**
9. 46 min, 52 min, 63 min, 45 min, 58 min, 60 min **Mean 54 Greater 3 Less 3**

Find the mean. Round to the nearest tenth.

10. 1.8 km, 1.2 km, 2.1 km, 1.9 km, 1.8 km **1.8 km**
11. 3.4 s, 3.6 s, 4.1 s, 4.5 s, 3.7 s, 4.4 s **4.0 s**

Solve.

12. Eric's marks on 5 tests were 70, 75, 80, 72, and 73. What was the mean score, the range, and the total score for the 5 tests?
Mean 74 Range 10 Total 370
13. Danielle had a mean score of 79 on 5 tests. Her first 4 test scores were 75, 79, 85 and 80.
What did she score on her last test? **76**

A Mean Age

Diter is 11 years 2 months old. His friends Debbie and Ralph are 10 years 11 months and 11 years 8 months old. What is their mean age? Try to find a short cut for solving this problem.

11 and 3 months

245

Assigning the Practice

Minimum: 1-12

Average: 1-13

Enriched: 1-13

Reinforcement

1. Have the students compute their own mean test scores in math and spelling.
2. List the points scored by various teams for the past six or seven games separately on cards. (Use the newspaper sports pages for this information.) Ask the students to compute the mean scores.
3. Use the data of the heights of the students from the previous lesson. Ask the students to compute the mean heights for the boys, the girls, and the entire class.

Enrichment

1. Assign *A Mean Age* at the bottom of page 245. Have the students discuss their solution strategies.
2. Play the card game suggested in the Enrichment section on page 243. Players find the mean instead of the mode. The mean for each hand is the number of points awarded. The winner is the first player to get 100 points.
3. Have the students use sports or environmental statistics to make other cards for calculating the mean. These can be included with the set mentioned in the second Reinforcement activity above.

Extra Practice

Worksheet A59

Pages 244-245

Find the mean. Round to the nearest whole number.

1. 10 cm, 11 cm, 14 cm, 12 cm, 13 cm **12 cm**
2. 21 kg, 34 kg, 45 kg **33 kg**
3. 1.8 km, 2.0 km, 3.1 km, 1.4 km, 4.4 km **3 km**
4. 12.6 L, 15.8 L, 23.7 L, 18.5 L **18 L**

Find the mean. Round to the nearest tenth.

5. 7.28 cm, 7.84 cm, 6.64 cm, 7.54 cm **7.3 cm**
6. 0.49 m, 0.44 m, 0.5 m **0.5 m**

Solve.

7. In 6 basketball games, Mandy scored 10, 12, 8, 18, 6, and 12 points.
What was her mean number of points per game? **11**

Objective A60

Find the median.

Introducing the Lesson

Ask 5 students to estimate the number of hours they would normally watch television in one week. List these figures on the chalkboard. Ask the students to name the *range*, the *mode*, and the *mean* of the data.

Review that the mean and the mode are two ways of describing an average. Explain that there is a third way; finding the **median**. Arrange the figures in numerical order. Point out that the middle number in the list is the median. Discuss the three kinds of averages. Ask the students to name advantages and disadvantages for the use of each.

Teaching the Lesson

Read and discuss the explanation of the median at the top of page 246. In the first example, point out that there is an odd number of test scores, hence there is a middle number which is the median. The second example shows how the median is computed when there is an even number of test scores.

Use actual (unnamed) student math or spelling test scores to provide additional practice in finding the median. Stress how scores must be put in order for this method of averaging.

Ask seven students of various heights to stand in line. Have the students determine what must be done to find their median height. 1. *measure the heights*. 2. *order the heights*. Ask the students also to compute the mean and the mode of the 7 heights. Repeat, with 6 different students.

The Median

Miss Lindstrom gave a surprise test.

The marks were 60, 78, 75, 90, 42, 60, 95, 85, and 70

Write the marks in order, from smallest to largest.

42 60 60 70 75 78 85 90 95

The *middle number* (the 5th number) is 75.

The middle number is called the **median**.



If there are two middle numbers, the median is the number halfway between them.

42 60 60 70 75 77 78 85 90 95

The median is 76

EXERCISES

Find the median.

1. 3, 4, 7, 9, 10 **7**
2. 4, 5, 8, 10, 11, 12, 15 **10**
3. 10, 12, 15, 16, 18, 20, 22 **16**
4. 30, 32, 36, 38, 39, 43 **37**
5. 72 cm, 73 cm, 77 cm, 81 cm **75 cm**
6. 116 g, 119 g, 120 g, 130 g, 137 g, 142 g **125 g**

Write the numbers in order and then find the median.

7. 175, 163, 179 **163, 175, 179**
8. 49, 31, 35, 44, 37, 42, 39
9. 9, 16, 11, 8, 22 **8, 9, 11, 16, 22**
10. 51, 50, 56, 53 **52**
11. \$86, \$80, \$89, \$90, \$78, \$63, \$90, \$75, \$10, \$88, \$89, \$80 **\$83**
12. 3 kg, 4 kg, 9 kg, 2 kg, 2 kg, 7 kg, 1 kg, 10 kg, 2 kg, 9 kg **3.5 kg**

Using the Exercises

- Questions 1 to 6 require the students to find the median from a list of ordered numbers. All that is necessary is to find the middle number.
- Questions 7 to 12 require students to order sets of numbers and then find the middle number (or median).

PRACTICE

Find the median.

- 82, 95, 78, 91, 86 **86**
- 65, 58, 61, 72, 57, 70 **63**
- 14, 18, 23, 16, 36, 14, 18, 12, 16, 23, 14, 20, 19, 12 **17**
- 42°C, 12°C, 30°C, 34°C, 20°C, 19°C **25°C**
- \$19, \$8, \$9, \$24, \$22, \$10, \$20, \$20, \$18, \$19, \$19, \$16, \$20 **\$19**
- 26 m, 16 m, 9 m, 8 m, 12 m, 17 m, 20 m, 27 m, 8 m **16 m**
- 57 kg, 70 kg, 61 kg, 60 kg, 63 kg, 61 kg **61 kg**

Find the median and the mean to the nearest tenth.

- 6, 12, 9, 7, 6 **7, 8**
- 13, 6, 12, 5 **8.5, 9**
- 22 cm, 25 cm, 30 cm, 21 cm, 37 cm, 27 cm, 30 cm, 23 cm, 20 cm
- 9.61 g, 8.99 g, 8.43 g, 7.87 g, 8.05 g **25, 26.1**
8.43, 8.6

Solve.

- Ten students measured the lengths of their right hands. The results were: 18 cm, 20 cm, 17 cm, 23 cm, 20 cm, 20 cm, 21 cm, 20 cm, 19 cm, and 18 cm. Find the mode, **20** the mean, the median, and the range of the measures.
20, 19.6, 6
- What information would help you to decide whether it is safe to cross a stream? the mean depth, the range, the median depth, or the mode? (Assume you can't swim.) **Range**
- Try to find seven numbers so that:
 - mean < median < mode
 - median < mean < mode
 - mean < mode < median
 - mode < median < mean

Batting Averages

If a baseball player gets 38 hits in 109 times at bat, his or her batting average is

$$\frac{38}{109} = 0.349 \text{ (to the nearest thousandth).}$$

Use a calculator to find who has the best batting average.

Linda Lipka

	Times at Bat	Hits
Jill Wahl	98	32
Linda Lipka	112	39
Sharon Nolan	116	40



247

Assigning the Practice

Minimum: 1-9, 12

Average: 4-12

Enriched: 6-14

Reinforcement

- Provide data on the number of students absent from the whole school each day for one week. Ask the students to find the median, the mean, and the mode from these figures.
- Play the card game suggested in the Enrichment section on page 243. This time have the players, in turn, find the mean, median, and mode for the five cards dealt to them. Points are given if the three kinds of averages are computed correctly according to whichever is the highest number (the mean, median, or mode). The winner is the first player to reach 100.
- Use statistics obtained from track and field events in gym class to provide practice in finding the mean, median, and mode.

Enrichment

- Assign *Batting Averages* at the bottom of page 247. Explain that the use of the term *average* here refers to a fractional part of a whole rather than to a middle score.
- Have the students find the mean, median, and mode of: 16, 14, 16, 21, 10, and 7. Then have them include the number 35 in the set of numbers and repeat the three calculations. Ask, "When 35 was included, by how much did the mean, median, and mode change? Which one changed the most?"

Extra Practice

Worksheet A60

Pages 246-247

Find the median

- 9, 11, 13, 12, 10, 16, 17 **12**
- 45, 51, 43, 48 **46.5**
- 97, 91, 93, 94, 98, 96, 92, 99 **95**
- 23, 34, 1, 56, 78, 89, 67, 12, 45 **45**

Find the median and the mean.

- 0.3, 0.4, 0.5, 0.2, 0.1, 0, 0.6 **Median 0.3 Mean 0.3**
- 10.4, 10.3, 10.2, 10.9 **Median 10.35 Mean 10.45**

Solve.

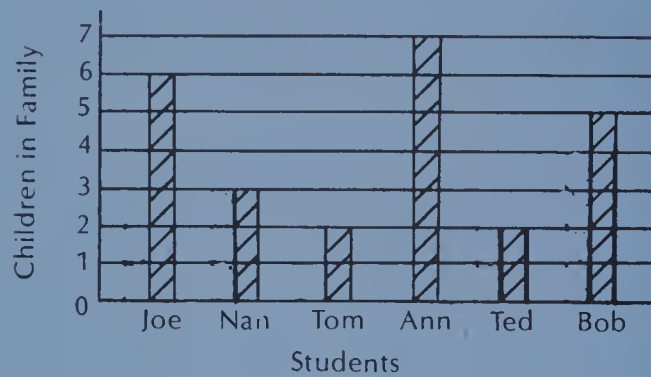
- The prices of seven bicycles are \$250, \$425, \$135, \$175, \$320, \$235, and \$135. What is the median price of the bicycles? **\$235**
What is the mode price? **\$135** What is the mean price? **\$239**

Objective GR1

Read and construct bar graphs.

Introducing the Lesson

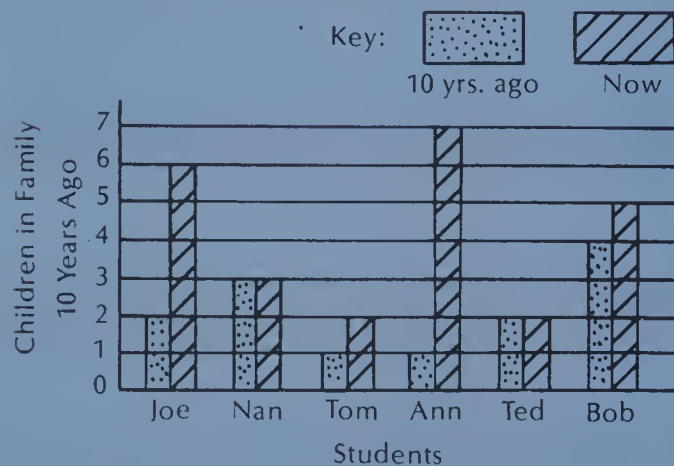
Ask each student to name how many children are in their families. Illustrate this data in a large chalkboard bar graph. Let the students help you decide on the intervals that would be most appropriate to use on the vertical axis of the graph.



Discuss how data can be more clearly understood or compared when it is presented in graphic form.

Teaching the Lesson

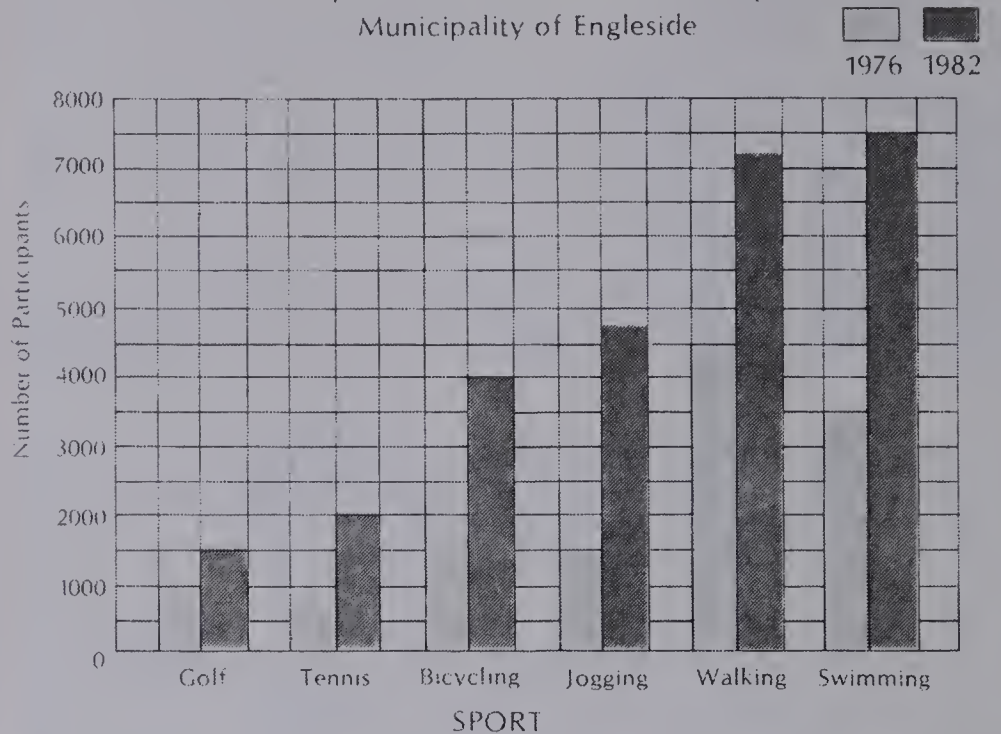
Now ask the students how many children were in their families 10 years ago. Illustrate this data on the bar graph already made. Discuss and compare the data illustrated. Stress the necessity of making a key.



Discuss the bar graph at the top of page 248. Point out that this graph shows two sets of information. Note the key which indicates these two sets. Discuss the sports mentioned on the horizontal axis. Point out the intervals used on the vertical axis to show the number of participants.

Bar Graphs

Participation in Fitness and Amateur Sport
Municipality of Engleside



EXERCISES

Use the graph to answer the questions.

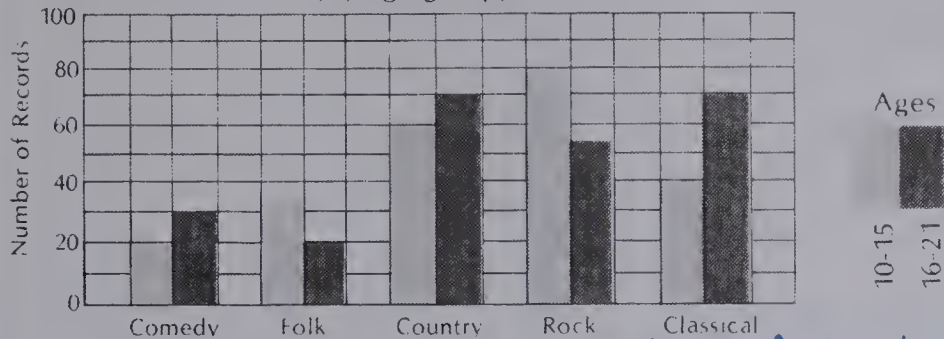
- What information is provided by the graph? *Numbers participating in sports in 2 different years.*
- How is the data for 1976 shown? for 1982? *1976 green bars, 1982 purple bars*
- How many people played golf in 1976? in 1982? *1000 1500*
- How many people bicycled in 1976? in 1982? *2000 4000*
- How many people swam in 1976? in 1982? *3500 7500*
- What was the most popular fitness activity in 1976? in 1982? *Swimming Walking*
- Which two sports had the greatest increase in participation? *Jogging and Swimming*
- Did any activity have a decrease in participation? *No*

Using the Exercises

- Questions 1 to 8 can be used as an oral, guided activity. At this time, help those students needing more explanation.

Practice

Records Bought at Sam's Record Store During Month of June
(by age group)



- What information is provided by the graph? *Kinds of records sold according to age.*
- How is the number of records bought by each group shown? *By different coloured bars.*
- How many comedy records were bought by each group? *20 by 10-15 group, 30 by 16-21*
- How many country records were bought by each group? *60 by 10-15, 70 by 16-21*
- Which type of record was least popular with the older group? *Folk*
- Which type was most popular with the younger group? *Rock*
- Which types did both groups like about the same? *Comedy, Country*
- When they were seven years old, Martin and Teresa were both 125 cm tall. When they were nine, Martin was 130 cm and Teresa was 140 cm. When they were eleven, Martin was 150 cm and Teresa was 145 cm. Make a graph to show this.

Budget Time

Paul and Petra each get a weekly allowance of \$7.00. One week, Paul spent his as follows: bus fare \$1.00, school supplies \$0.50, snacks \$2.30, tickets for entertainment \$2.50, savings \$0.70. Petra spent hers like this: bus fare \$1.80, school supplies \$2.40, snacks \$1.60, tickets for entertainment \$0, savings \$1.20.

Make a graph to show how Paul and Petra spent their allowances.

249

Assigning the Practice

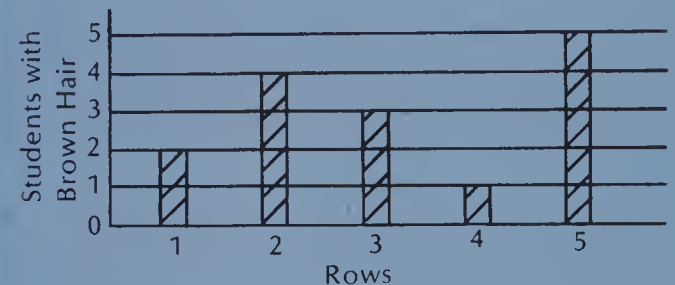
Minimum: 1-7

Average: 1-8

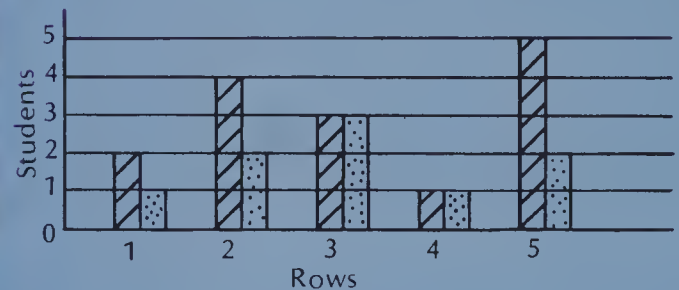
Enriched: 1-8

Reinforcement

- Assign *Budget Time* at the bottom of page 249.
- Have the students count the number of brown-haired students in each row of the classroom. Make a bar graph of this data.



Then, ask them to make a second graph showing the number of light-haired students in each row as compared with the number of dark-haired students. Have them make a key for this graph.



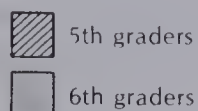
Enrichment

- Have the students survey fourth and fifth graders about which of five popular TV shows they like best. Then have them construct a double bar graph from the data.
- Ask the students to research the population growth of two Canadian cities over regular time intervals and make a double bar graph from the data.
- Have the students graph the results of their weekly spelling and math tests on a double bar graph.

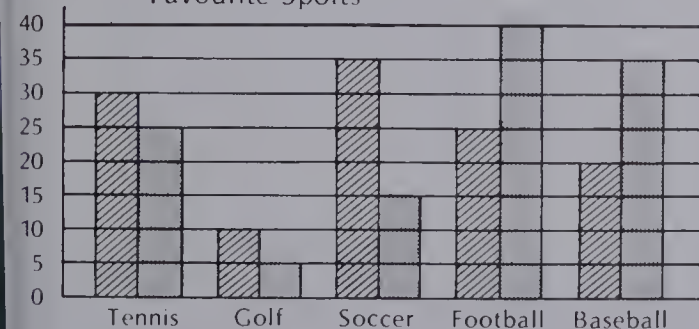
Extra Practice

Worksheet GR1

Pages 248-249



Favourite Sports



- How many 5th graders chose soccer as their favourite sport? *35*
- How many 6th graders chose tennis as their favourite sport? *25*

- How many more 6th graders than 5th graders liked football best? *15*
- How many 5th graders were surveyed? *120*
- How many 6th graders were surveyed? *120*

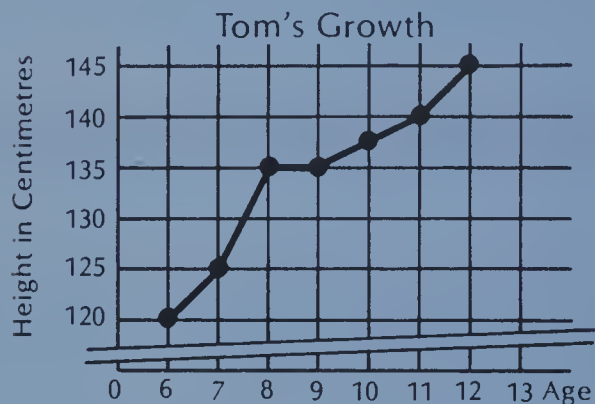
UNIT 11 LESSON 5

Objective GR2

Read and construct line graphs.

Introducing the Lesson

Sketch the following graph on the board.

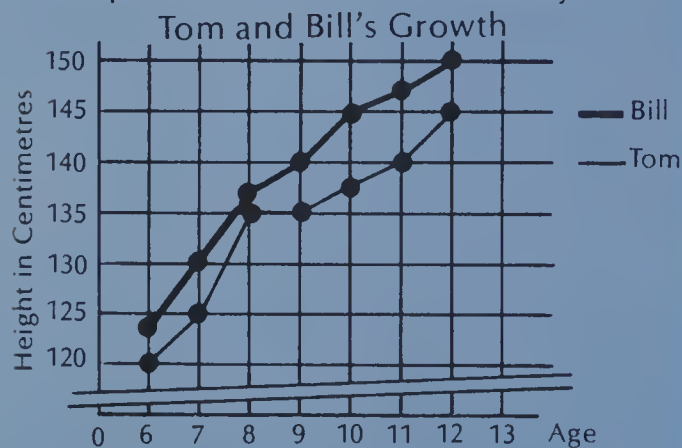


Ask, "What does the graph illustrate? How tall was Tom at age 6? 8? 10? 12? Between which two ages did Tom grow the most? the least? About how tall was Tom at age 7½? 11½?"

Point out that a line graph shows a growth (or decline). Explain that a line graph shows specific data and is useful in seeing and predicting trends. "What do you think Tom's height will be at age 13?"

Teaching the Lesson

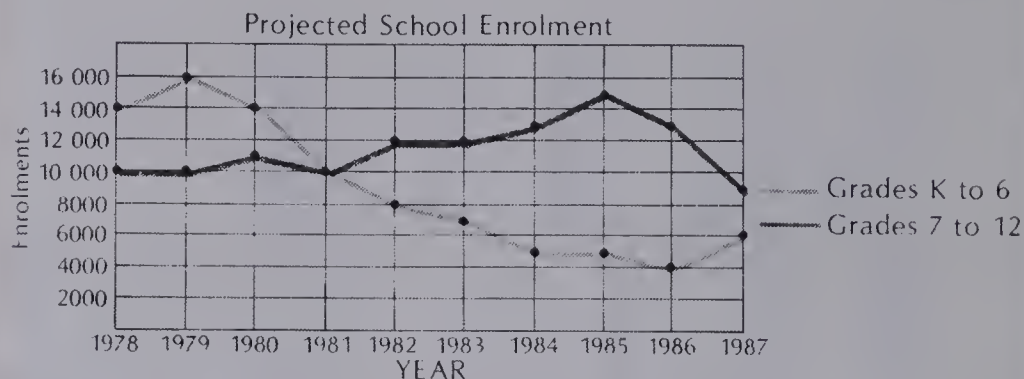
Add the growth of another person to the chalkboard line graph. Discuss the necessity for a key and the usefulness of two different colours for the lines. Ask questions about the double line graph that require the students to compare the data for the two boys.



Read and discuss the graph on page 250. Ask, "What was the enrolment for Grades K to 6 in 1978? 1979? 1982? What was the enrolment for Grades 7 to 12 in 1978? 1979? 1982? Between which years was the enrolment for Grades 7 to 12 greater than the enrolment for Grades K to 6?"

Line Graphs

A school superintendent made a graph of the projected enrolment in her district's schools. She joined the dots on the graph with line segments to help show the trends.



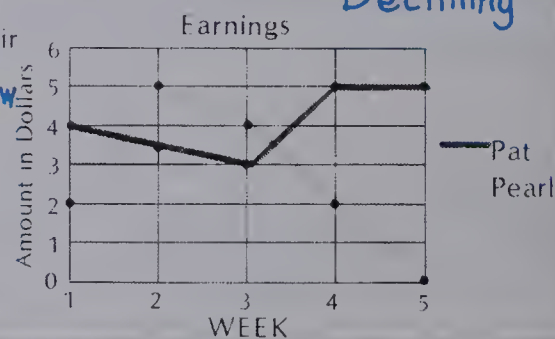
EXERCISES

Use the graph to answer the questions.

- What does the red line indicate? **Grades 7 to 12**
What does the green line indicate? **Grades K to 6**
- What was the enrolment in Grades K to 6 in 1979? in 1980? **16 000 14 000**
- What was the enrolment in Grades 7 to 12 in 1980? **11 000**
- What is the projected enrolment in Grades K to 6 in 1987? **6000**
- When does the enrolment in Grades 7 to 12 peak? **1985**
- What has been happening to the enrolment in Grades K to 6? **Declining**

Pat and Pearl kept a graph of their earnings from baby sitting.

- How are Pearl's earnings indicated? Pat's? **Yellow Red**
- How much did Pat earn in week 2? in week 4? **\$3.50 \$5.00**
- What week did Pearl not earn anything? **5**

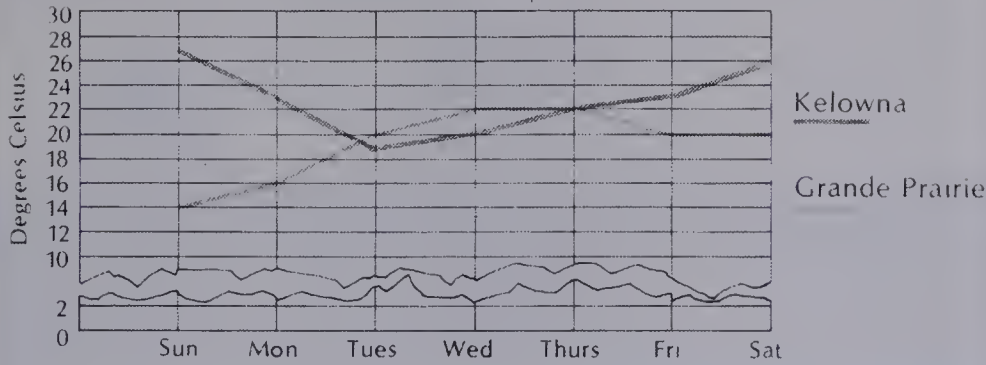


250

Using the Exercises

- Questions 1 to 9 require the students to read and interpret the line graphs. Only those students who show no difficulties in interpreting graphs should do these questions independently.

High Temperature at Kelowna and Grande Prairie
First Week in May



- What information does the graph show? *High temperatures for a week.*
- Give the temperatures for Kelowna and Grande Prairie on Sunday. *27°C, 14°C*
- When was the temperature the lowest for Kelowna? *Tuesday*
- When was the temperature for Kelowna and Grande Prairie the same? *Thursday*
- Which city had its higher temperatures in the middle of the week? *Grande Prairie*

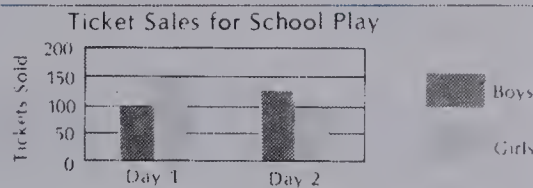
REVIEW

- A58 What are the range and mode?
- 20, 13, 20, 23, 27 *Range 14, Mode 20*
 - 37, 52, 52, 46, 37, 41, 52 *Range 15, Mode 52*

- A59 Find the mean. Round to the nearest whole number.
- 70, 39, 62, 45 *54*
 - 305, 315, 234, 226, 263 *269*

- A60 Find the median.
- 28, 17, 14, 19, 17, 16, 18 *17*
 - 18, 16, 21, 19 *18.5*

- GR1
- How many tickets did the boys sell on Day 1? *100*
 - Who sold more tickets on Day 2? *Boys*



251

Assigning the Practice

Minimum: 1-5

Average: 1-5

Enriched: 1-5

Review Exercises

Questions	Objective	Pages
1-2	A58	242-243
3-4	A59	244-245
5-6	A60	246-247
7-8	GR1	248-249

Reinforcement

- Ask the students to make a line graph of the daily high temperatures in your area for two weeks.
- Have the students illustrate the comparison of the daily high temperatures of two Canadian cities by making a double line graph.
- If possible, have the students make a growth line graph for themselves. Display their work.
- Ask the students to make a line graph from the following average monthly temperatures.

Jan.	0°C	July	24°C
Feb.	4°C	Aug.	25°C
Mar.	10°C	Sept.	20°C
Apr.	15°C	Oct.	18°C
May	18°C	Nov.	10°C
June	22°C	Dec.	5°C

Enrichment

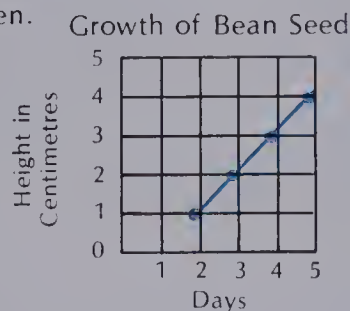
Encourage the students to find line graphs in magazines and newspapers, bring them to class, and explain the information illustrated.

Extra Practice

Complete the line graphs from the information given.

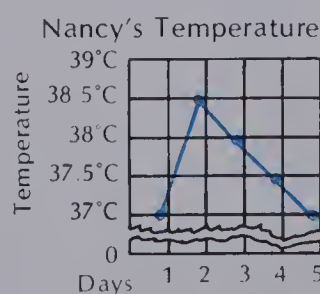
- Growth of Bean Seed

Day	2	3	4	5
Height	1 cm	2 cm	4 cm	5 cm



- Nancy's Temperature

Day	1	2	3	4	5
Temperature	37°C	38.5°C	38°C	37.5°C	37°C



UNIT 11 LESSON 6

Objective M14

Identify angles and use the terms vertex, right angle, straight angle, perpendicular, acute, and obtuse.

Introducing the Lesson

Show the following line segment on an overhead projector. Explain how it is identified.

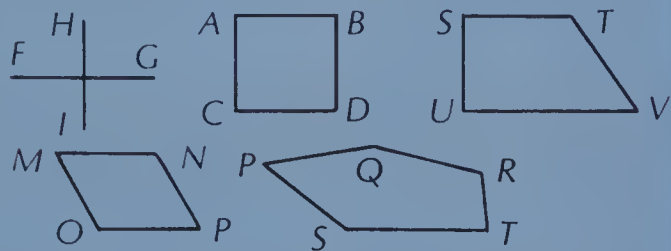
A _____ B line segment AB

Make an angle using line segment AB. Define an angle as the meeting of two line segments. Describe the vertex of the angle as point A. Have the students name the line segments meeting at point A to form the angle. Explain how the angle is identified. Note that the vertex is mentioned in the middle of the identifying letters.

Teaching the Lesson

Start with **right angles** on a worksheet. Let the students discover that a corner of an index card fits exactly into certain angles. These are right angles. Point out that the two sides or line segments forming the right angles are said to be **perpendicular** to each other. Show the students how to mark the perpendicular or right angle in each of the right angles on their sheets.

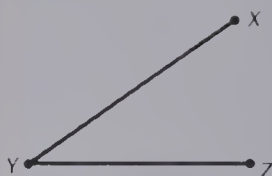
Ask, "Can you see any right angles in our classroom?" Have the students mark and identify all right angles. Also, include the following on the worksheet.



Ask the students to find all angles on their worksheet that are smaller than a right angle. Explain that these are called **acute**. Point out the **obtuse** angles, also, which are larger than a right angle.

Show and explain a **straight angle** as being a straight line. Summarize all angle terminology by reading and discussing the top of page 252.

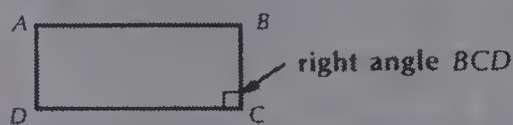
Angles



Line segments YX and YZ meet at point Y and form an **angle** at Y.

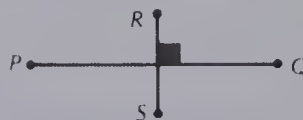
It is called angle XYZ or just angle Y. Point Y is called the **vertex** of the angle.

A **right angle** is formed at the corner (or vertex) of a square or rectangle.



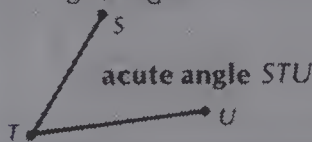
EFG is called a **straight angle** because EG is a straight line.

Lines or segments that meet at right angles are said to be **perpendicular**.

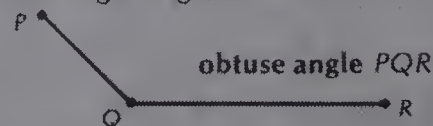


PQ is perpendicular to RS.

An **acute angle** is smaller than a right angle.



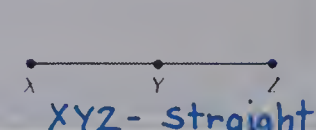
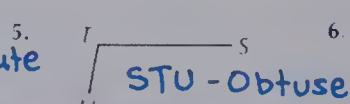
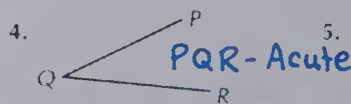
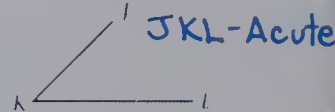
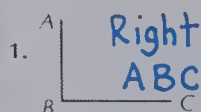
An **obtuse angle** is larger than a right angle.



EXERCISES

Is the angle acute, obtuse, right, or straight?

Name the angle using the letters shown



252

Using the Exercises

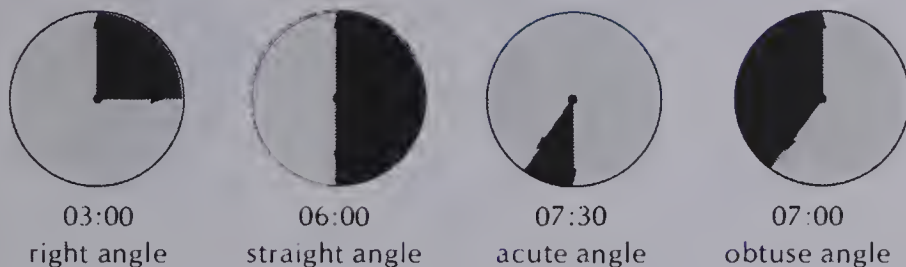
- Questions 1 to 6 require the students to identify acute, obtuse, right, and straight angles. Do the first two questions together as a class and point out how the answer is to be stated. Be sure that the vertex letter of the angle is mentioned in the middle of the angle's three identifying letters. For example:
right angle ABC
obtuse angle DEF

PRACTICE

Name all the angles in each figure.
Label each as *obtuse*, *acute*, *right*, or *straight*.

1. 2. 3. 4. 5. 6. 7. List all the angles formed when these two lines intersect. Describe each angle as obtuse or acute. 8. Trace the figure on the right. Turn the tracing about point X so that D is over E and F is over G. What do you notice?

Clock Angles



Name the angles formed by the clock hands at each time.

1. 09:00 2. 02:00 3. 11:30 4. 08:15 5. 10:45
 Right Acute Obtuse Obtuse Acute

6. How many straight angles are formed during a twelve-hour period?

12 253

Assigning the Practice

Minimum: 1-7

Average: 1-8

Enriched: 1-8

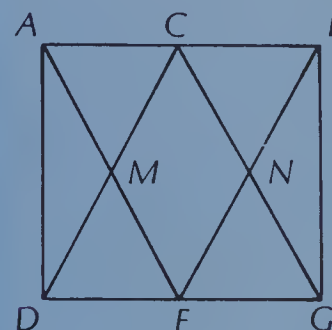
Reinforcement

1. Assign *Clock Angles* at the bottom of page 253. Provide clocks for those students who need them.

2. Display the 26 capital letters of the alphabet. Ask the students to list the letters that contain right angles, acute angles, obtuse angles, and straight angles.

3. Have the students complete the following using *right*, *acute*, *obtuse*, or *straight*.

- Angle BNG is _____.
- Angle ADG is _____.
- Angle FNG is _____.
- Angle DMC is _____.
- Angle ABG is _____.
- Angle CNB is _____.
- Angle FNB is _____.
- Angle AMD is _____.



Enrichment

Show the students how to create line designs using a ruler and angles, intersecting lines, and/or polygons.



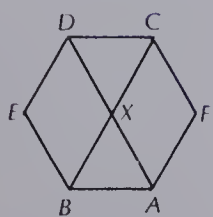
Extra Practice

Is the angle acute, obtuse, right, or straight?
Name the angle using the letters shown.

1. 2. 3. 4. 5.

Complete. Use acute, obtuse, right, or straight.

6. a. Angle NQR is A.
 b. Angle MNP is S.
 c. Angle MPR is R.
 d. Angle QRN is A.
 e. Angle MQR is R.
 f. Angle MQN is A.
 g. Angle PRQ is R.
 h. Angle QMN is R.
7. a. Angle DXC is A.
 b. Angle DXB is O.
 c. Angle BAX is A.
 d. Angle AXD is S.
 e. Angle CFA is O.
 f. Angle BXC is S.
 g. Angle XAF is A.
 h. Angle FAB is O.



UNIT 11 LESSON 7

Objective M15

Measure angles in degrees.

Introducing the Lesson

Review how angles are classified (page 252).

Draw a 50° angle on the chalkboard. Explain that angles can be measured just as lengths, areas, masses, and capacities can. Point out the need for a standard unit of measure.

Have ready a cardboard 5° angle. Tell the students that this could be the unit of measure. Place it on the 50° angle and have the students count the number of these cardboard units needed to fill the angle. Explain that this is how we measure angles.

Teaching the Lesson

Introduce the **protractor** as the measuring instrument for angles and the **degree** as the unit of measure. Refer to the illustration at the top of page 254. Point out that the marks on the rim of the protractor indicate the measure in degrees. Give each student a protractor so that all may see the degree markings.

Pass out a sheet having various kinds of angles to be measured on it. Explain the steps for measuring an angle using one of the angles on the sheet.

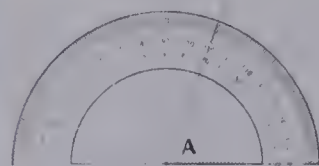
- Make an estimate. "Is the angle a right angle, an acute angle, or an obtuse angle?"
- Place the protractor on the angle. The vertex of the angle must be on the centre mark of the protractor. One side of the angle must be on 0° .
- Read the measure of the angle. "Did you estimate your angle to be a right angle? Then the other side of your angle should be on 90° ." If the angle was estimated to be obtuse, the student reads the degrees from the set of numbers greater than 90° .
- Label the measure of the angle.

Have the students work in pairs to measure the rest of the angles on the sheet. Then they compare and discuss their findings.

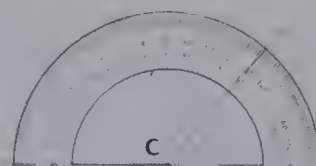
Measuring Angles

The unit for measuring angles is the **degree**. An angle of one degree (1°) would look like this.

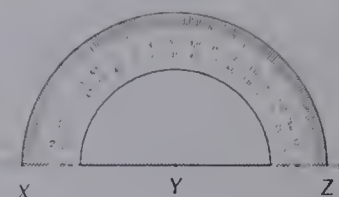
A **protractor** is used to measure the size of an angle in degrees.



Angle A is 70° .



Angle C is 130° .

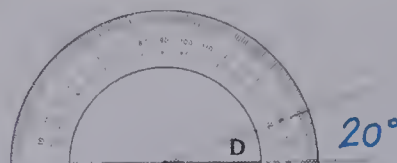


Angle XYZ is 180° .

EXERCISES

What is the size of the angle?

1.



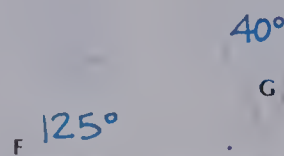
2.



Use a protractor to measure the angle.

3.

4.



40°

G

5.

H 30°

6.



180°

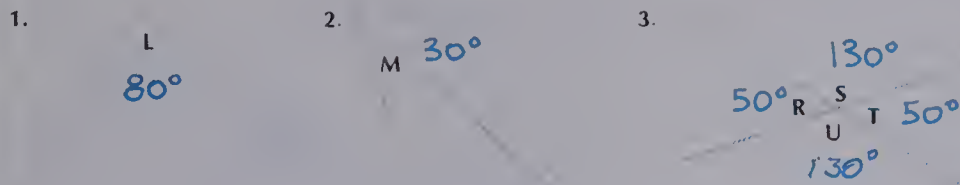
- What is the size of a right angle? 90°
- Describe an acute angle using degree measures. $< 90^\circ$
- What is the size of a straight angle? 180°
- Describe an obtuse angle using degree measures. $> 90^\circ$

Using the Exercises

- Questions 1 to 6 require the students to measure angles. For questions 3 to 6, the angles may have to be traced and then extended with a straightedge before they can be measured accurately.
- Questions 7 to 10 require the students to define acute, obtuse, right, and straight angles in terms of degrees.

PRACTICE

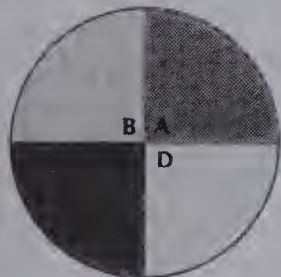
Measure the angles.



Construct an angle of the given size. Use a protractor.

4. 40°
5. 25°
6. 90°
7. 80°
8. 110°
9. 135°
10. 160°
11. 180°
12. 77°
13. 48°

Circles Know All the Angles!



1. Measure the angle.

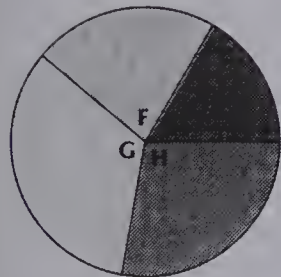
Angle A is 90°

Angle B is 90°

Angle C is 90°

Angle D is 90°

The sum of the angles at the centre of the circle is 360°



2. Measure the angle.

Angle E is 60°

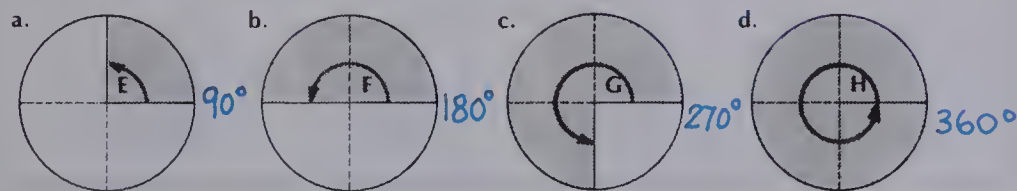
Angle F is 80°

Angle G is 120°

Angle H is 100°

The sum of the angles at the centre of the circle is 360°

3. What is the measure of each angle?



255

Assigning the Practice

Minimum: 1-2, 4-8

Average: 1-11

Enriched: 3-13

Reinforcement

1. Have the students work in pairs. Ask them to draw six angles with their rulers and then exchange them with partners for measuring.

2. Ask the students to measure the number of degrees in the *Clock Angles* on page 253.

3. Have the students measure the angles of the following polygons.



4. Ask the students to construct angles of 15° , 30° , 45° , 60° , 75° , 90° , 105° , 120° , 135° , 150° , 165° , and 180° .

Enrichment

1. Assign *Circles Know All the Angles* at the bottom of page 255.

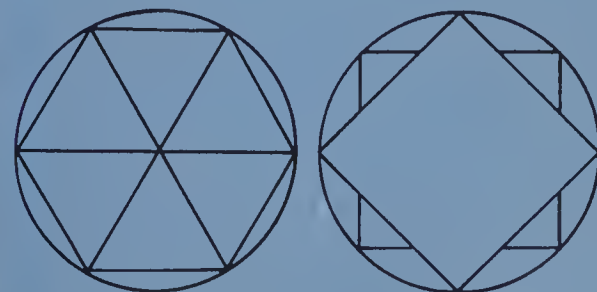
2. With a ruler and protractor, have the students construct:

- a. a square with 5 cm sides
- b. a rectangle with 10 cm and 5 cm sides
- c. a triangle with 5 cm sides and all angles 60° .

3. Have the students complete the following chart by constructing and measuring several of each kind of polygon.

Polygon	Sum of Angles
Triangle	
Quadrilateral	
Pentagon	
Hexagon	

4. Show the students how to make circles with protractors. Have them mark off every 20° , 30° , or 40° and create protractor designs. Can they duplicate these designs?

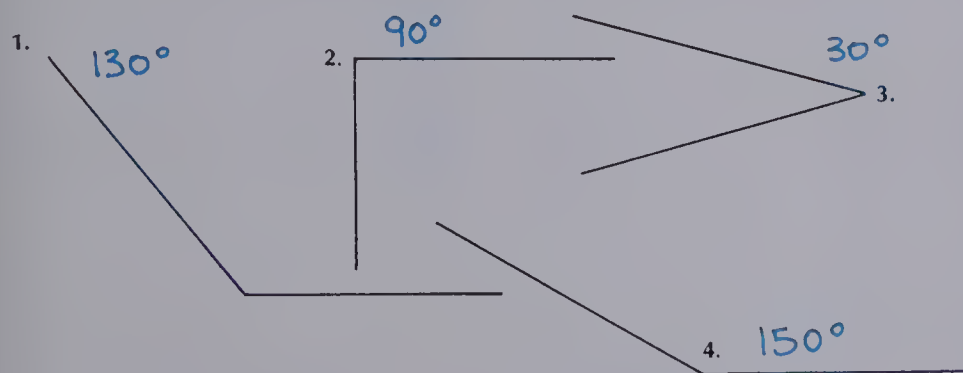


Extra Practice

Worksheet M15

Pages 254-255

Measure the angles.



5. Construct a 90° angle.
6. Construct a 10° angle.
7. Construct a 115° angle.

Objective GR3

Read and construct circle graphs.

Introducing the Lesson

Recall the usefulness of bar and line graphs in illustrating data. Explain that you are going to show the students another kind of useful graph. Write the names of four colours on the chalk-board. Ask twelve students to tell their favourite colour of the four. Tally their choices and prepare the following table.

Colour	Number of Students	Fraction of all Students
Blue	6	$\frac{6}{12}$ or $\frac{1}{2}$
Red	3	$\frac{3}{12}$ or $\frac{1}{4}$
Yellow	1	$\frac{1}{12}$
Green	2	$\frac{2}{12}$ or $\frac{1}{6}$

Teaching the Lesson

Explain that this data can be clearly illustrated with a circle graph. Point out that the 360° circle represents the whole group of students and that the four sections of the circle represent the four colour choices. Show how the size of each section can be obtained by multiplying the fraction by 360°. Then construct and discuss the circle graph.

Blue: $\frac{1}{2} \times 360 = 180^\circ$

Red: $\frac{1}{4} \times 360 = 90^\circ$

Yellow: $\frac{1}{12} \times 360 = 30^\circ$

Green: $\frac{1}{6} \times 360 = 60^\circ$

Favourite Colours

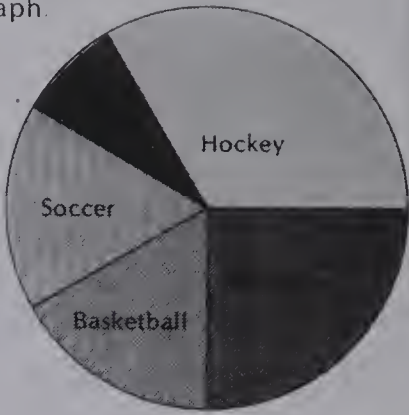
Repeat the development of a circle graph using hair colours (red, blond, brown, black) of 24 students. Make a similar table of the data before making the circle graph.

Discuss the data in the table at the top of page 256. Explain how the fraction in simplest terms was obtained for each sport. Also show how the size of the angle in the circle graph for each sport was obtained by multiplying the fraction by 360°.

Circle Graphs

Frank asked 36 people, "What is your favourite sport?" Then he made a table of values and a circle graph.

Sport	Number of Votes	Fraction of Total	Size of Angle
Hockey	12	$\frac{1}{3}$	120°
Baseball	9	$\frac{1}{4}$	90°
Basketball	6	$\frac{1}{6}$	60°
Soccer	6	$\frac{1}{6}$	60°
Football	3	$\frac{1}{12}$	30°
TOTAL	36		360°



Find the fraction by dividing the number of votes by the number of people.

$\frac{12}{36} = \frac{1}{3}$ $\frac{9}{36} = \frac{1}{4}$ $\frac{6}{36} = \frac{1}{6}$ $\frac{3}{36} = \frac{1}{12}$

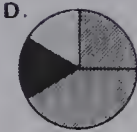
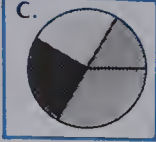
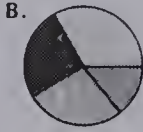
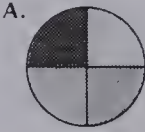
There are 360° in a full turn. Frank found the size of each angle by multiplying 360 by the fraction.

EXERCISES

Copy and complete the table.

1.	Favourite Colour	Number of Votes	Fraction of Total	Size of Angle
	Red	8	$\frac{1}{3}$	120°
	Blue	6	$\frac{1}{2}$	90°
	Orange	6	$\frac{1}{4}$	90°
	Yellow	4	$\frac{1}{6}$	60°
	TOTAL	24		360°

2. Which circle graph illustrates table 1?



Using the Exercises

- Questions 1 and 2 require the students to complete the steps involved in making a circle graph. Point out that the students must make a circle graph from the data presented in the table so that they can correctly answer the second question.

PRACTICE

Copy and complete the table.

Construct a circle graph to show the information.

1.

Lunch Hour Activity	Time in Minutes	Fraction of Time	Size of Angle
Eat	30	$\frac{1}{2}$	180°
Read	20	$\frac{1}{3}$	120°
Talk	10	$\frac{1}{6}$	60°
TOTAL	60		360°

2.

Daily Activity	Number of Hours	Fraction of Day	Size of Angle
Sleeping	8	$\frac{1}{3}$	120°
Eating	3	$\frac{1}{8}$	45°
School	6	$\frac{1}{4}$	90°
Play	4	$\frac{1}{6}$	60°
Homework	3	$\frac{1}{8}$	45°
TOTAL	24		360°

3. Crude oil is made into several different fuel oils.

A typical yield from 48 L of crude oil would be

Gasoline — 8 L

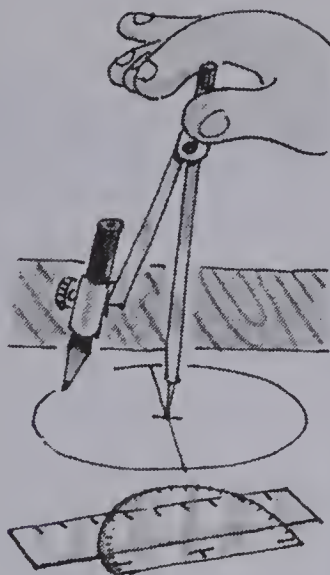
Diesel — 12 L

Kerosene — 8 L

Heating oil — 16 L

Other — 4 L

Make a circle graph to show this information.



A Pizza Puzzle

A medium pizza from Bitondo's has a radius of 20 cm

If the pizza is cut into 10 equal pieces, what is the angle formed by each piece?

$$\frac{1}{10} \times 360^\circ = 36^\circ$$

What is the area of one piece?

$$\frac{36}{360} \times \pi R^2 \text{ (Use } \pi = 3.14 \text{)}$$

Copy and complete the chart

Number of Equal Pieces	Angle	Area of One Piece
10	36	125.6 cm ²
6	60°	209.3 cm ²
12	30°	104.7 cm ²
4	90	314 cm ²
2	180°	628 cm ²

257

Assigning the Practice

Minimum: 1-2

Average: 1-3

Enriched: 1-3

Reinforcement

Have the students take surveys and complete tables as shown below. Then ask them to make a circle graph from the information in the table.

1. TV Shows (specify the names)

Favourite TV Show	Number of Votes	Fraction of Total	Size of Angle

2. Records (specify the names)

Favourite Records	Number of Votes	Fraction of Total	Size of Angle

3. Beverages (specify the kinds)

Favourite Beverage	Number of Votes	Fraction of Total	Size of Angle

4. School Subject (specify the subjects)

Favourite Subject	Number of Votes	Fraction of Total	Size of Angle

Enrichment

1. Assign A Pizza Puzzle at the bottom of page 257. Review the formula for finding the area of a circle on page 106.

2. Have the students colour circles as specified.

a. Circle A
50% red
10% blue
40% green

b. Circle B
25% yellow
5% brown
40% orange
30% purple

c. Circle C
20% pink
20% green
60% tan

d. Circle D
75% red
5% purple
10% blue
10% yellow

Extra Practice

Worksheet GR3

Pages 256-257

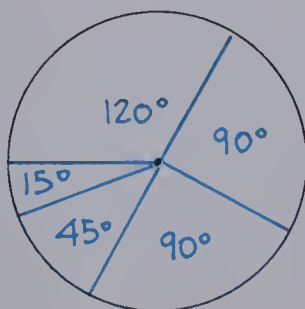
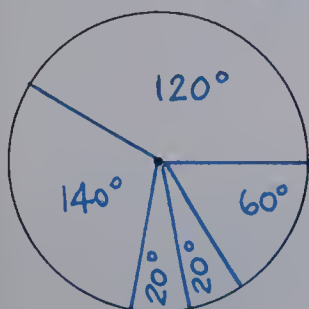
Complete the tables. Make circle graphs.

1.

Favourite Dessert	Number of Votes	Fraction of Total	Size of Angle
Cake	12	$\frac{1}{3}$	120
Pie	6	$\frac{1}{6}$	60
Ice Cream	14	$\frac{7}{18}$	140
Fruit	2	$\frac{1}{9}$	20
Cheese	2	$\frac{1}{9}$	20

2.

Favourite Books	Number of Votes	Fraction of Total	Size of Angle
Mystery	6	$\frac{1}{4}$	90
History	1	$\frac{1}{24}$	15
Biography	3	$\frac{1}{8}$	45
Sports	8	$\frac{1}{3}$	120
Animals	6	$\frac{1}{4}$	90



UNIT 11 LESSON 9

Objective GR4

Read and write coordinates.

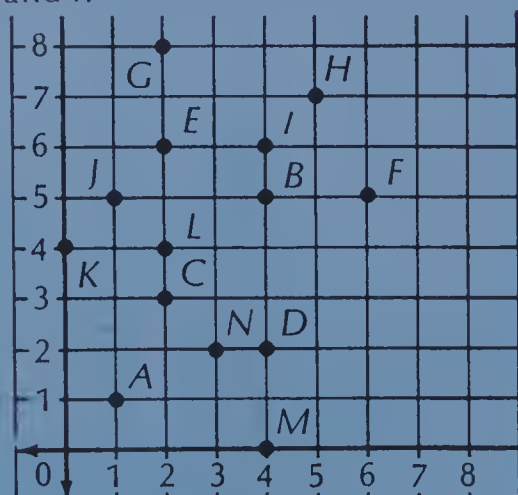
Introducing the Lesson

Sketch a horizontal line on the chalkboard. Mark it in equal intervals. Number the marks, starting with 0, to form a horizontal number line. Then sketch a line perpendicular to the first. Have the students mark equal intervals and number it as a vertical number line. Sketch a grid on the two **axes**. Point out that the **horizontal axis** measures distance across the grid and that the **vertical axis** measures distance up (and down) the grid. Explain that the place where the measurements start is called the **origin** and that it is located at the intersection of the horizontal and vertical axes.

Teaching the Lesson

Point out that an **ordered pair** (or **coordinates**) locates points on the grid. The numbers appear in a specific order to indicate, first, the horizontal and, second, the vertical distance from the origin to a point on the grid. For example, the ordered pair (2, 4) indicates a distance of 2 units horizontally from the origin and then a distance of 4 units vertically.

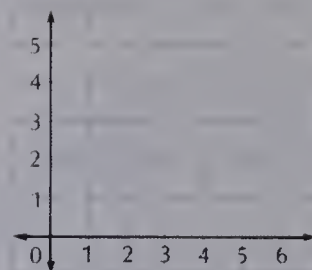
Show the following grid on an overhead projector. Have the students first give the letter found at each of these locations: (2, 6) (4, 2) (2, 4) (1, 5) (0, 4) (4, 0) (2, 3) and (3, 2). Then ask them to name the ordered pair (or coordinates) for each of these locations: A, B, F, G, H, and I.



Summarize the lesson as you read and discuss the top of page 258 with the class.

Ordered Pairs

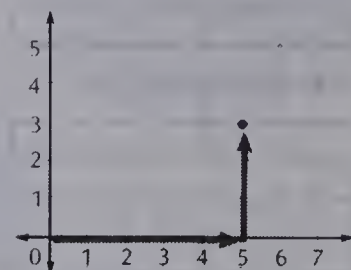
Each **axis** of the grid is a number line. The two **axes** are perpendicular.



The point where the number lines intersect is called the **origin**.

To locate the point for the ordered pair (5, 3):

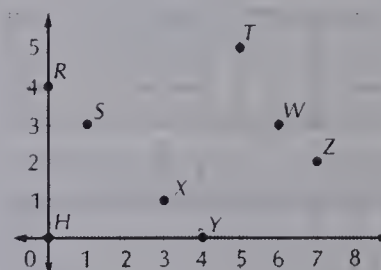
1. Start at the origin.
2. Move 5 units to the right
3. and then 3 units up.



EXERCISES

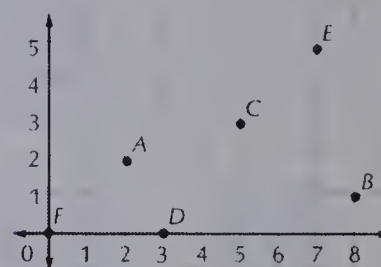
Write the letter name for the ordered pair.

- | | |
|--------------------|--------------------|
| 1. (3, 1) X | 2. (1, 3) S |
| 3. (7, 2) Z | 4. (0, 4) R |
| 5. (5, 5) T | 6. (6, 3) W |
| 7. (0, 0) H | 8. (4, 0) Y |



Write the ordered pair for each point.

- | | |
|--------------------|--------------------|
| 9. A (2,2) | 10. B (8,1) |
| 11. C (5,3) | 12. D (3,0) |
| 13. E (7,5) | 14. F (0,0) |



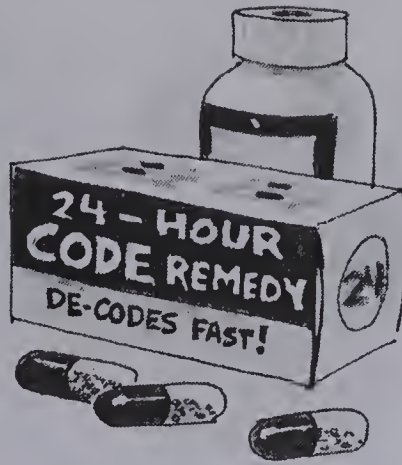
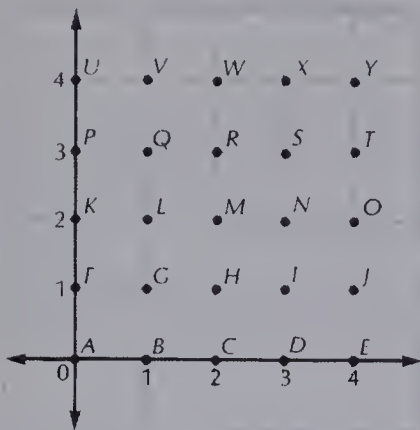
258

Using the Exercises

- Questions 1 to 8 involve reading an ordered pair and naming what is found at the location it indicates.
- Questions 9 to 14 involve writing an ordered pair that describes a specific location.

PRACTICE

- Use the grid to decode the message.



(4, 4) (4, 2) (0, 4) **YOU** (1, 1) (4, 2) (4, 3) **GOT**
 (2, 3) (3, 1) (1, 1) (2, 1) (4, 3) **RIGHT** (4, 3) (4, 2) **TO**
 (4, 3) (2, 1) (4, 0) **THE** (0, 3) (4, 2) (3, 1) (3, 2) (4, 3) **POINT**

Use the same grid. Write the ordered pairs that spell each word.

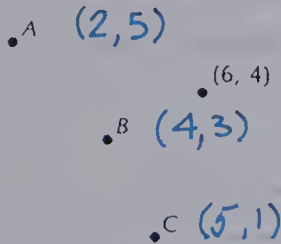
- FIRST (0,1)(3,1)(2,3) (3,3)(4,3)
- MATH (2,2)(0,0) (4,3)(2,1)
- BREAK (1,0)(2,3)(4,0) (0,0)(0,2)

- What is the ordered pair for the origin? (0,0)

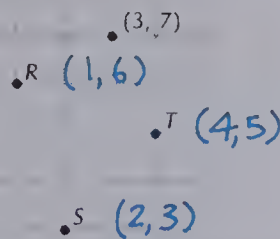
No Axes to Guide

The axes and some of the grid have been torn away.
 What are the coordinates of the lettered points?

1.



2.



259

Assigning the Practice

Minimum: 1-5

Average: 1-5

Enriched: 1-5

Reinforcement

- Assign *No Axes to Guide* at the bottom of page 259.

- Have the students draw a grid from the rows and desks of the classroom. Then ask them to write ten students' names and write the ordered pair that describes the location of each of their desks in the room, e.g., Row 3, Desk 5.

- Give the students graph paper and a ruler. Ask them to make horizontal and vertical axes and to number each from 0 to 20. Then have them plot and connect the following points on the grid to make a picture of a butterfly.

- (9, 13) (9, 5) (10, 5) (10, 13) (9, 13) (7, 17) (4, 17) (2, 13) (3, 10) (2, 7) (4, 3) (7, 3) (9, 5) lift pencil
- (10, 13) (12, 17) (15, 17) (17, 13) (16, 10) (17, 7) (15, 3) (12, 3) (10, 5) lift pencil
- (9, 13) (8, 20) lift pencil
- (10, 13) (11, 20) lift pencil

Enrichment

- Provide each student with a geo-board and elastic bands. Have them use the elastic bands to make horizontal and vertical axes and then number the points on the axes.

- Make triangles with vertices (corners) at (2, 2), (4, 2), and (3, 5); (1, 1), (1, 4), and (4, 1); and (1, 2), (5, 2), and (5, 3).

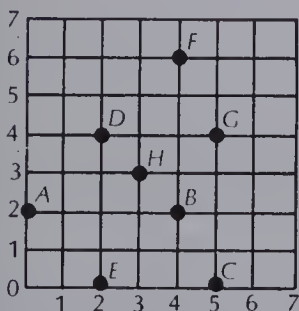
- Make a square on the geoboard and name the locations of the vertices.

- Make a right triangle on the geoboard and name the locations of the vertices.

- Provide road maps and a list of cities. Have the students name the coordinates for each city.

Extra Practice

- Write the ordered pair for each point.

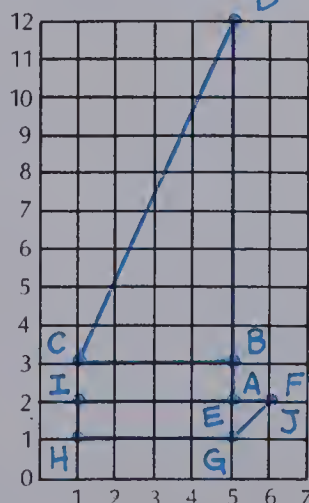


Worksheet GR4

Pages 258-259

- Mark the points for each ordered pair on the grid. Join them in the order given to make a picture.

- (5, 2)
- (5, 3)
- (1, 3)
- (5, 12)
- (5, 2)
- (6, 2)
- (5, 1)
- (1, 1)
- (1, 2)
- (6, 2)



A (0,2) B (4,2) C (5,0) D (2,4)
 E (2,0) F (4,6) G (5,4) H (3,3)

Objective PS12

Solve problems by analogies with simpler problems.

Introducing the Lesson

Give the students the following problem. "A student survey indicated that 48% preferred pizza to hamburgers. If 50 students were surveyed, how many students liked pizza?" Allow the class some time to suggest solutions to the problem. Point out that one way to understand and solve it would be to use *simpler numbers*. "If 50% of the 50 surveyed preferred pizza, how many students preferred pizza?" By recalling that $50\% = \frac{1}{2}$, then half of the 50 surveyed is easily determined as 25 students preferring pizza.

$50\% = \frac{1}{2} = 0.50$

50

×0.50

25.00

or $\frac{1}{2} \times 50 = 25$

Now go back to the original problem. Since 50% of 50 was found by multiplying, 48% of 50 is found in the same way.

50

×0.48

400

200

24.00

24 students preferred pizza.

Teaching the Lesson

Read and discuss the first problem and strategy at the top of page 260. Draw a chalkboard illustration to show what the statement, "John has four times as much money as Len" looks like in smaller numbers.

After it is clear that John has $\frac{4}{5}$ of the money and Len has $\frac{1}{5}$, illustrate also how $\frac{4}{5}$ of \$115 is \$92 and $\frac{1}{5}$ of \$115 is \$23.

Read and discuss the second problem and strategy on page 260. Complete the chart on the chalkboard as you explain the solution to the problem.

Problem Solving



Using Smaller Numbers

Together John and Len have \$115.
John has four times as much money as Len.
How much does each boy have?

This problem seems simpler if you start with smaller numbers. Suppose Len has \$1. Then John has \$4. That makes \$5 in all. It is clear that Len has $\frac{1}{5}$ of the money, and John has $\frac{4}{5}$.

So Len has $\frac{1}{5} \times \$115 = \23 .
John has the rest: $\$115 - \$23 = \$92$ or $\frac{4}{5} \times \$115 = \92 .

Restate the Problem: Break It into Simpler Parts

Last year, Cedar Golf Club charged a \$600 membership fee and \$10 for each game of golf. This year a membership costs \$650 and the golfing fee is \$6. How many times must you golf to make the new rates better?

Answer a series of simpler problems by using a chart.

	Member- ship fee	+ 1 Golf fee	+ 2 Golf fees	+ 3 Golf fees	+ 12 Golf fees	+ 13 Golf fees
Last year	600	610	620	630	720	730
This year	650	656	662	668	722	728

You must golf at least 13 times to make the new rates better.

EXERCISES

Solve.

1. Mary and Jean have \$132 together.
Mary has half as much as Jean.
How much does each girl have?
\$44, \$88

2. There are 4 roads from Aston to Bart, 3 from Bart to Coutts,
2 from Coutts to Dole, and 5 from Dole to Endlane.
How many ways are there of travelling from Aston to Endlane? 120

Using the Exercises

- Questions 1 and 2 should be used as an oral, guided lesson. See that the students understand their solutions before proceeding to page 261.
- Question 1 is similar to the first example at the top of the page. Using simpler numbers makes the solution to this problem clear.
- Question 2 can be solved more easily using simpler numbers and illustrations.

How many ways from A to C?



2 ways, or 2×1

How many ways from A to D?



4 ways, or 2×2



8 ways, or $2 \times 2 \times 2$

After trying several examples like the above, the number of ways from Aston to Endlane should be seen as $4 \times 3 \times 2 \times 5$, or 120.

Solve.

- The membership fee in a tennis club was raised from \$300 to \$375. The cost per game was reduced from \$8 to \$5. After how many games are the new rates better?

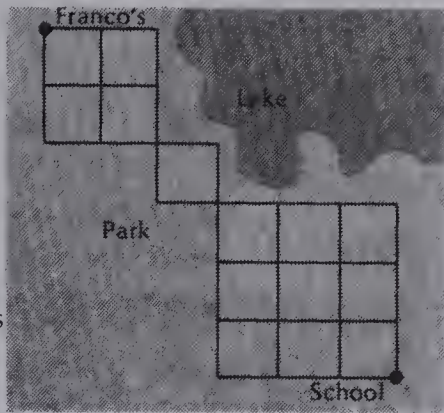
25

- Three boxes hold 105 model cars. Box B stores double that of box A and half that of box C. How many cars does each box store?

A 15, B 30, C 60

- Franco likes to walk a different way to school each day. How many paths can he take that are 12 blocks long?

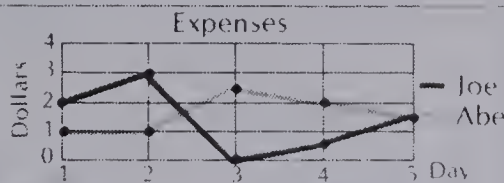
240



GR2

- How much did Joe spend on Day 2? Day 3? \$3.00, \$0

- On which days did Abe spend more than Joe? 3, 4

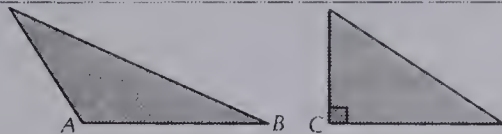


M14

Is the angle a right angle, acute angle, or obtuse angle?

- A
- B
- C

Obtuse Acute Right



M15

- Construct an angle of 60° .
- Construct an angle of 180° .

GR3

- In an hour of free time, Jan talked on the phone for 10 min, roller skated for 30 min, and read for 20 min. Construct a circle graph to show how she spent the hour.

GR4

Construct a coordinate graph. Put these points on the graph.

- P (3, 4)
- Q (0, 2)
- M (the origin)

261

Assigning the Practice

Minimum: 1

Average: 1-2

Enriched: 1-3

Review Exercises

Questions	Objective	Pages
1-2	GR2	250-251
3-5	M14	252-253
6-7	M15	254-255
8	GR3	256-257
9-11	GR4	258-259

Reinforcement

Discuss the solutions to the following problems. Encourage the use of analogies with simpler problems.

- In 3.5 h, Jack drove 315 km with his car. How much is that for 1 h?

(Simpler: He travelled 200 km in 2 h. How much for 1 h?)

- A punch recipe for six people calls for 12 L of ice cream. How much ice cream is required for five people?

(Simpler: A recipe for three people calls for 6 L of ice cream. How much for two people?)

- Harry and Myron paid \$5.40 for three bacon and tomato sandwiches. How much would five of these sandwiches cost?

(Simpler: Three sandwiches cost 90¢. What is the cost of five?)

Enrichment

Have the students solve the following.

- A pack of cats is chasing a flock of birds. If there are 40 feet and 28 eyes for all the animals, how many cats and how many birds are there? (Answer: 14 animals, 6 cats + 8 birds = 24 feet + 16 feet = 40 feet.)

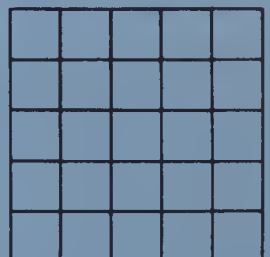
- How many squares?

Hint:

= 1 square

= 1 + 4 or 5 squares

= 1 + 4 + 9 or 14 squares



Extra Practice

Worksheet PS12

Pages 260-261

Solve.

- In Factory A, 6 workers can make 6 cabinets in 6 weeks. In Factory B, 4 workers can make 4 cabinets in 4 weeks. How many cabinets can Factory A and B make in 12 weeks? 12 each

- People arrived at a family reunion in groups. Each group that arrived had 2 more people than the group ahead of it. The first group to arrive was Jake and Ann. How many people attended the reunion if 10 groups came? 110

- Marcia is planning the seating arrangement at a circular table for herself, Ted, Vivian, Mae, and Sam. Marcia wants to sit next to her cousin Mae. How many different ways can she arrange the seating? 12

Problem Solving Activities

Assign Level 6, Unit 11

Unit 11 Objective	Test Questions	Pages
A58, A59, A60	1-3	242-247
GR1	4-5	248-249
GR2	6-8	250-251
M14	9-10	252-253
M15	11	254-255
GR3	12	256-257
GR4	13-15	258-259

TEST

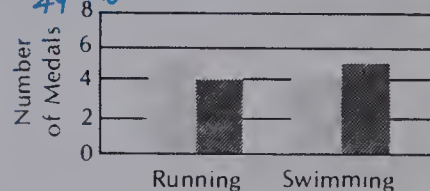
UNIT 11

What are the range, mode, mean, and median of each set of numbers? Round the mean to a whole number if necessary.

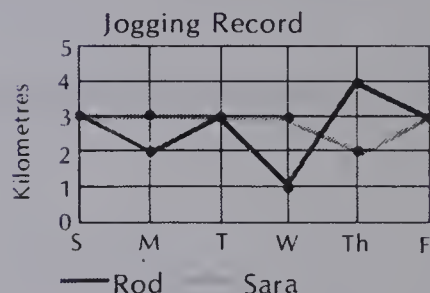
- 19, 24, 18, 29, 22, 19, 21 R Mode Mean Median
- 325, 325, 325, 300, 310 11 19 22 21
- 56, 40, 47, 49, 52, 47 25 325 317 48

Page School Gage School

- Which school won more medals for running? Page
- How many swimming medals did Gage School win? 5



- How many kilometres did Rod jog on Tuesday? 3 km
- On what day did Rod jog the farthest? Thursday
- Who had the steadiest jogging record? Sara



Name the angle which is:

- obtuse JKL

- straight MNO

H I K L M N O

- Which angle measures 15°? Y

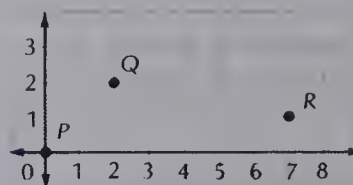
X

Y

- Mrs. Kaslo planted 12 ha of corn, 8 ha of potatoes, 2 ha of peas, and 2 ha of strawberries. Construct a circle graph to show the areas planted.

Write the ordered pair for the point.

- P (0,0)
- Q (2,2)
- R (7,1)



Post-test

Unit 11

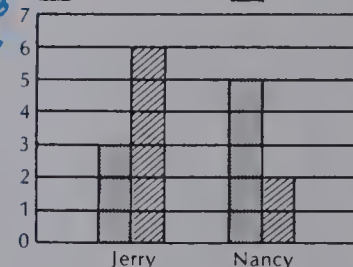
What are the range, mode, mean, and median of each set of numbers? Round the mean to a whole number, if necessary.

- 45, 32, 43, 37, 37, 35, 34 R Mode Mean Median
- 124, 116, 116, 109, 116 15 116 116
- 71, 65, 75, 71, 68, 73 10 71 71

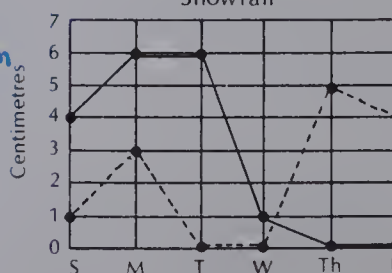
Books Read

Sports Stories Mysteries

- Who read more mysteries? Nancy
- How many books did Jerry read? 9



- How much snow fell in Beaverton on Thursday? 5 cm
- How much snow fell in Hapburg from Sunday through Friday? 17 cm
- How much more snow fell on Hapburg on Monday than on Beaverton? 3 cm



--- Beaverton — Hapburg

Median
37
116
71

What is the reciprocal?

1. $\frac{1}{7}$ 7 2. 9 $\frac{1}{9}$ 3. $\frac{4}{11}$ $\frac{11}{4}$ 4. $\frac{1}{5}$ 5

Divide

5. $\frac{4}{7} \div 3$ $\frac{4}{21}$ 6. $\frac{1}{5} \div 3$ $\frac{1}{15}$ 7. $\frac{2}{9} \div 2$ $\frac{1}{9}$ 8. $\frac{1}{11} \div 3$ $\frac{1}{33}$
 9. $6 \div \frac{1}{2}$ 12 10. $\frac{1}{5} \div \frac{1}{3}$ $\frac{3}{5}$ 11. $\frac{3}{8} \div \frac{1}{6}$ $\frac{9}{4}$ 12. $10 \div \frac{1}{4}$ 40
 13. $8 \div \frac{3}{4}$ $\frac{32}{3}$ 14. $\frac{1}{2} \div \frac{2}{3}$ $\frac{3}{4}$ 15. $\frac{5}{6} \div \frac{3}{8}$ $\frac{20}{9}$ 16. $9 \div \frac{5}{6}$ $\frac{54}{5}$
 17. $6 \overline{)3.6}$ 0.6 18. $7 \overline{)9.94}$ 1.42 19. $15 \overline{)0.375}$ 0.025
 20. $0.3 \overline{)21}$ 70 21. $0.8 \overline{)1.28}$ 1.6 22. $1.6 \overline{)0.208}$ 0.13
 23. $0.04 \overline{)0.032}$ 0.8 24. $0.05 \overline{)3.75}$ 75.0 25. $0.21 \overline{)16.8}$ 80.0

Divide. Round to the nearest hundredth.

26. $12 \overline{)1}$ 0.08 27. $0.3 \overline{)1.42}$ 4.73 28. $0.11 \overline{)9.7}$ 88.18

Write the fraction as a decimal.

Divide until the remainder is zero.

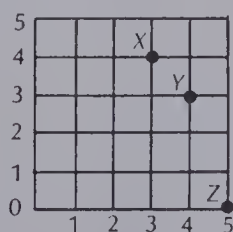
29. $\frac{5}{8}$ 0.625 30. $\frac{4}{10}$ 0.4 31. $\frac{15}{20}$ 0.75 32. $\frac{18}{16}$ 1.125

Solve.

33. I am thinking of a number. If I divide it by 3 and then add 3, the result is 8. What is the original number? 15

Name the angle which is:

9. straight ABC
 10. acute RST
 11. Which angle measures 10° ? G
 12. At a piano recital, there were 30 adults, 15 students, and 15 teachers. Make a circle graph to show the people who attended the recital.



Write the ordered pair for the point.

13. X (3,4) 14. Z (5,0) 15. Y (4,3)

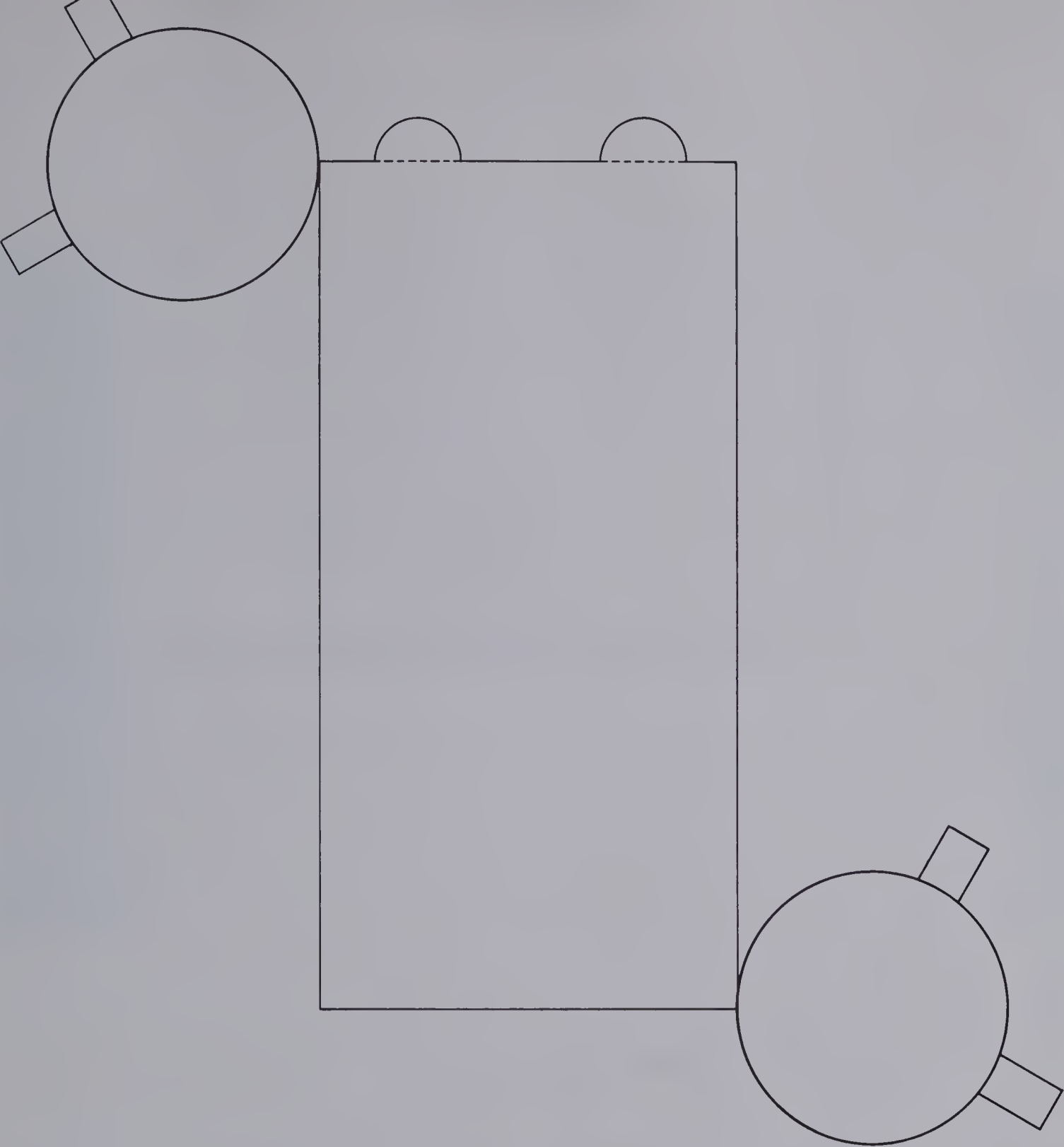
UNIT 12

Geometry

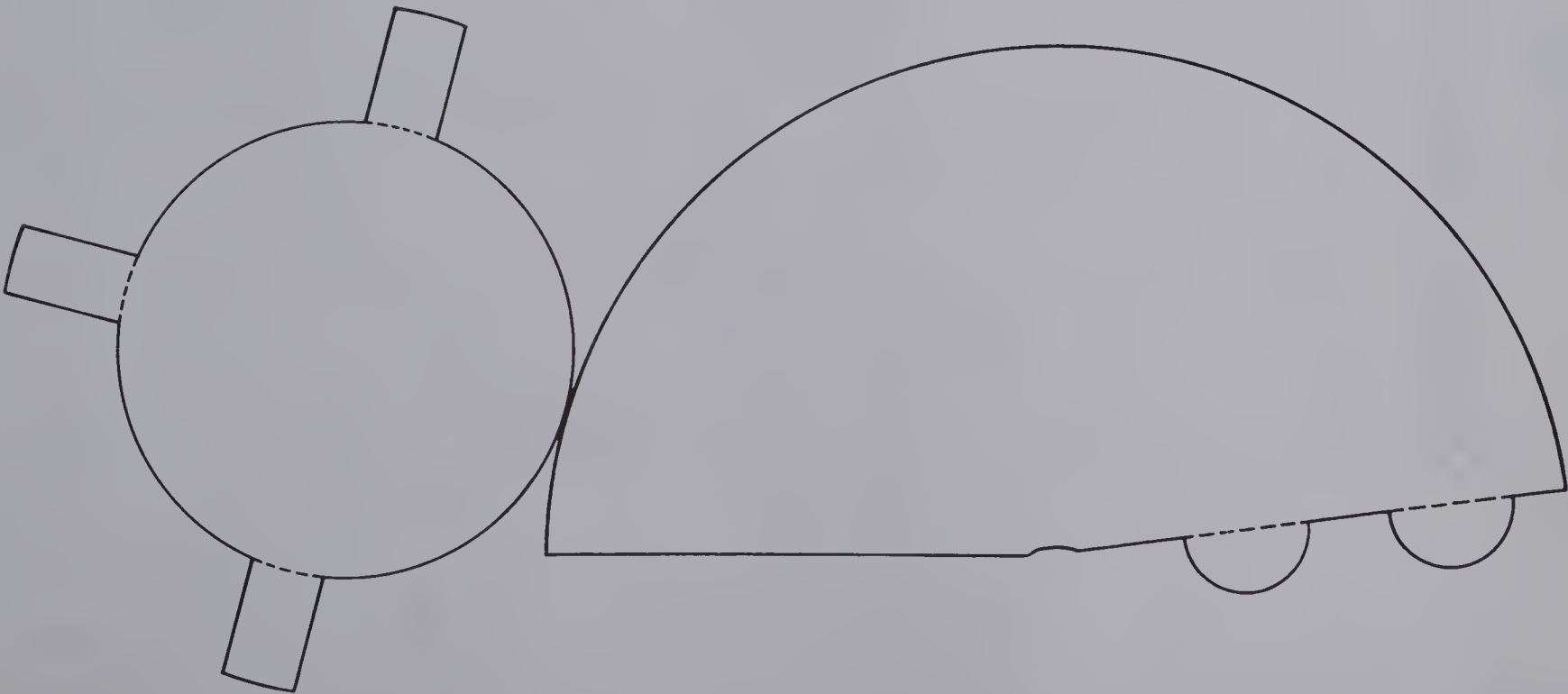
Theme: Geometry in Our World

Lesson		Objective	Pages
Preview		Review three-dimensional solids.	265
1	G1	Describe a slide on a coordinate grid.	266-267
2	G2	Recognize figures with line symmetry.	268-269
3	G3	Describe a flip on a coordinate grid.	270-271
4	G4	Describe a turn on a coordinate grid.	272-273
5	G5	Identify slides, flips, and turns on coordinate grids.	274-275
6	G6	Identify congruent triangles.	276-277
7	G7	Name corresponding parts (sides, angles, and vertices) of congruent triangles.	278-279
8	G8	Label angles and recognize perpendicular and parallel lines.	280-281
9	G9	Classify triangles by angles and sides.	282-283
10	G10	Classify quadrilaterals.	284-285
Test		Geometry	286
Review		Computation with whole numbers and decimals	287

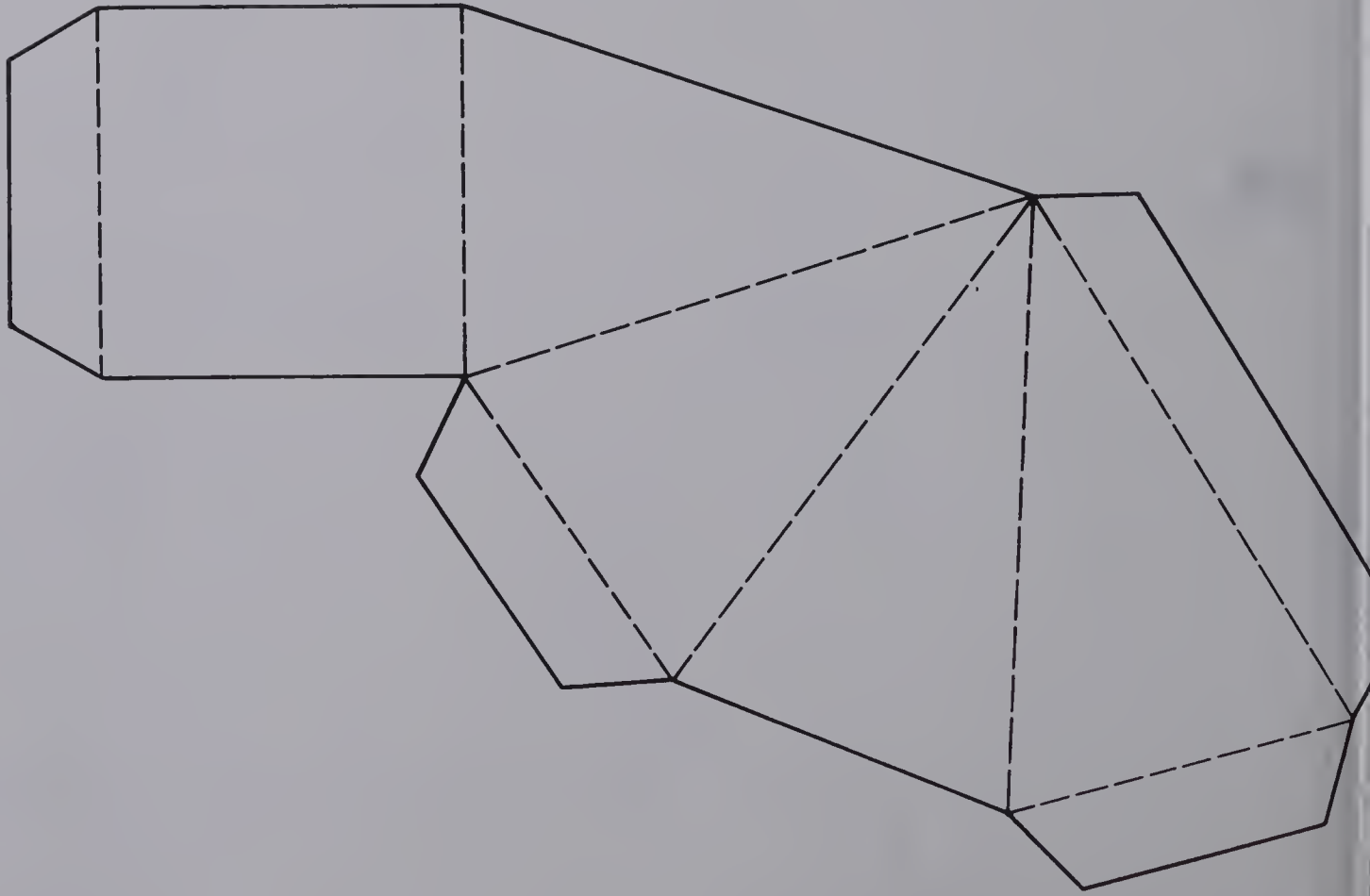
Cylinder



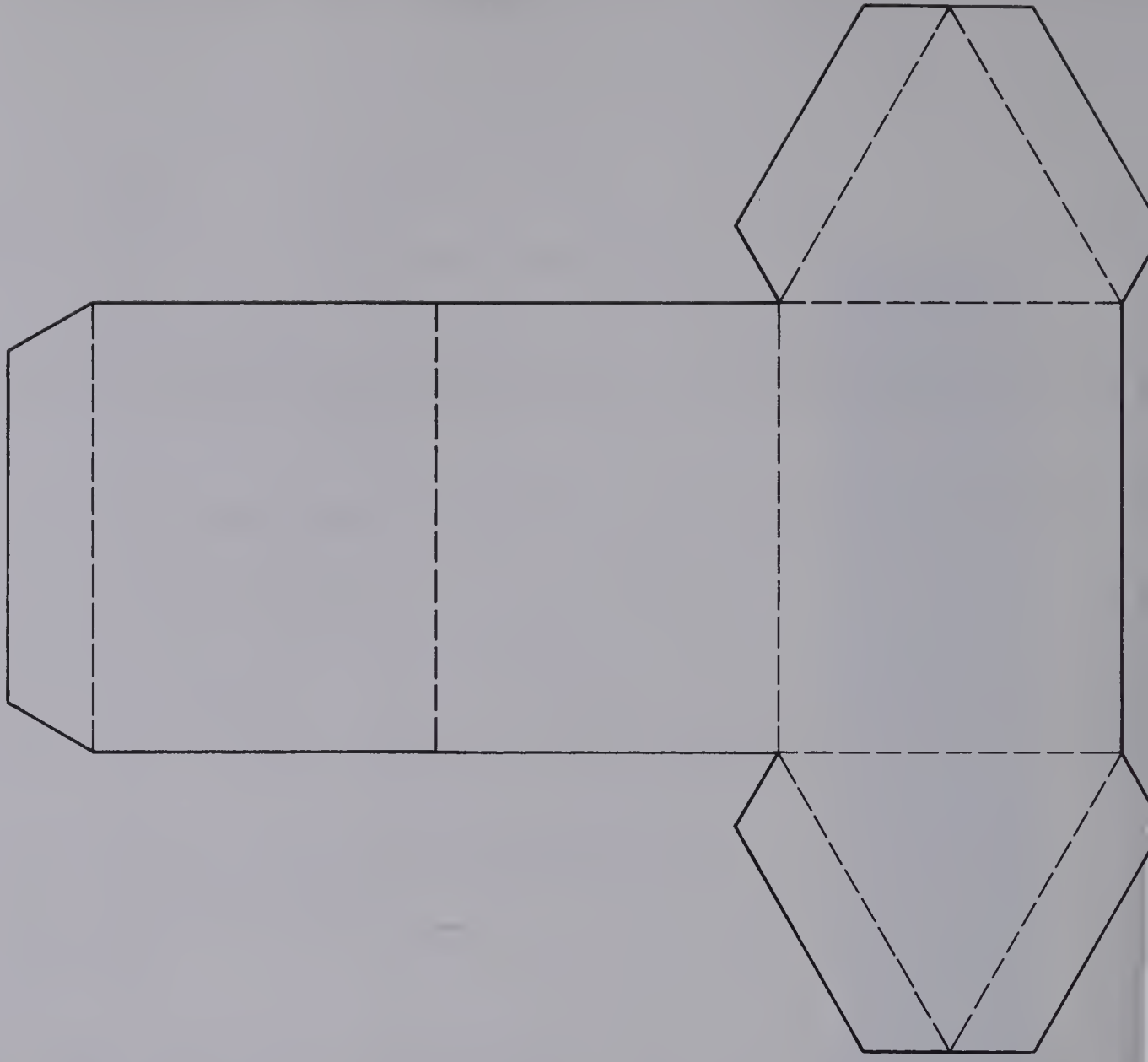
Cone



Square-based Pyramid



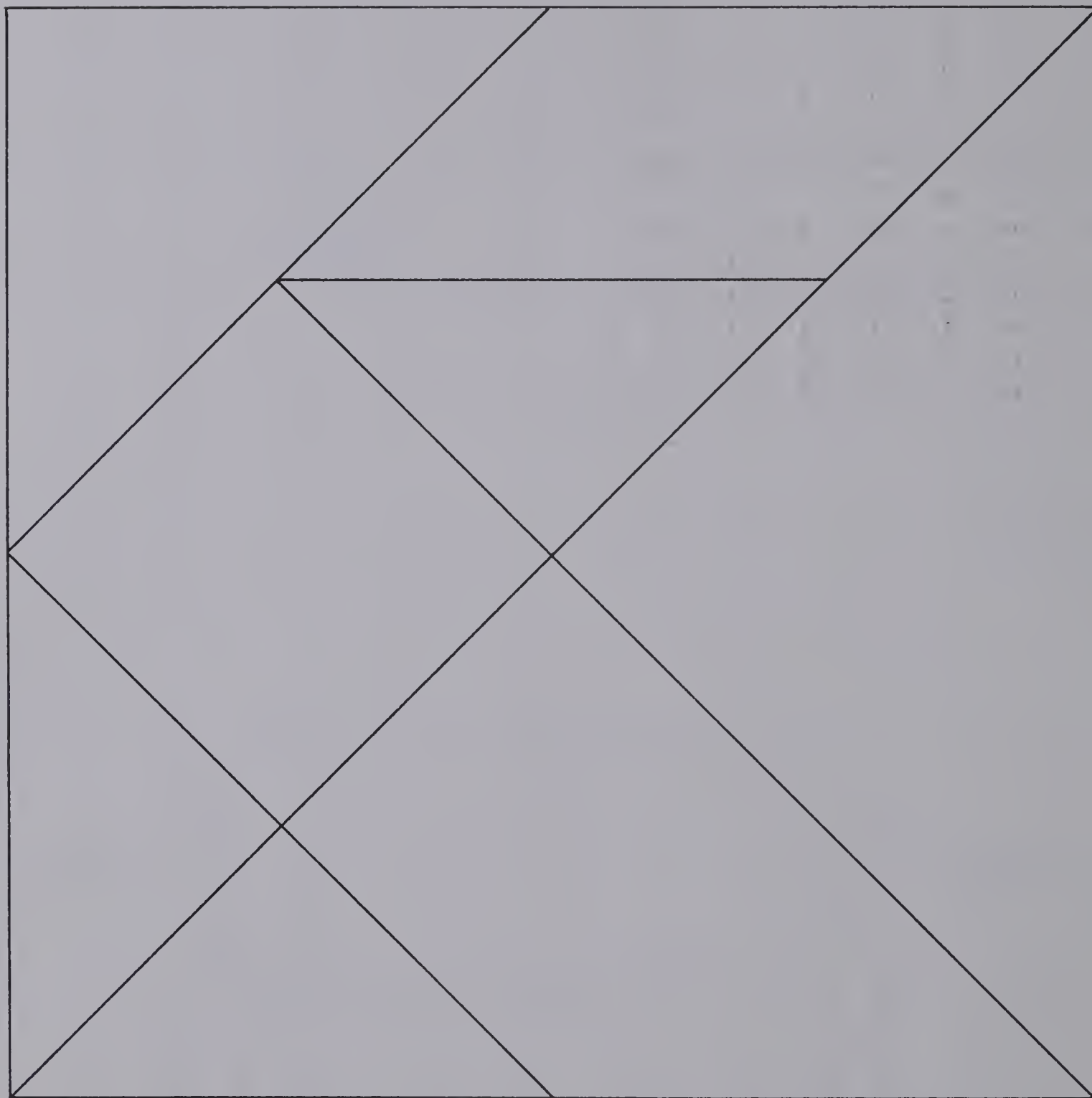
Triangular Prism



Dot Paper



Tangram Puzzle



About This Unit

The nature of the geometry in this unit is intuitive and informal. The basic purpose is *not* to have students learn a formal structure of facts and proofs. The purpose is to encourage students to observe the world about them and to help them organize their observations according to certain concepts or attributes.

The students' basic method should be one of exploration and discovery, therefore, encourage them in activities such as drawing, cutting, folding, and comparing. Give the students frequent opportunities to discuss their ideas and relate them to real-life experiences.

This unit will introduce some new vocabulary. However, students should be encouraged to express themselves in their own words at first and only adopt the correct terminology as they show successful work with the ideas. A note of caution: although the geometry in the program is taught intuitively and informally, that does not mean that the ideas are incidental.

Ideas

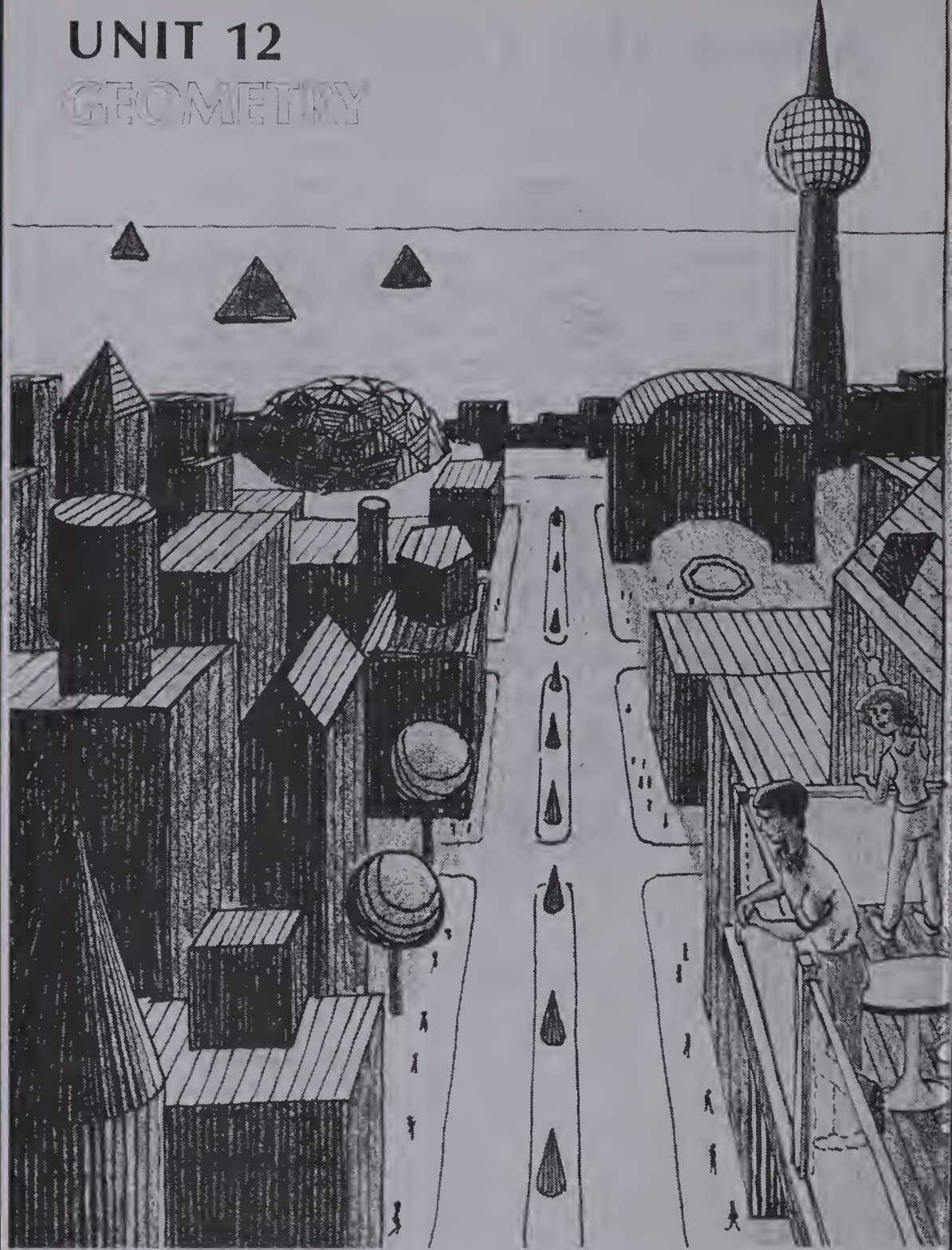
In as much as the unit deals with solids and plane figures, it is helpful to have models such as boxes, balls, cans, cones, triangles, parallelograms, and so on.

Geoboards could be used very effectively in teaching the lessons that deal with polygons, symmetry, coordinates, slides, flips, turns, and congruence.

A bulletin board would be helpful in displaying the relationships or classifications of various geometric shapes.

UNIT 12

GEOMETRY

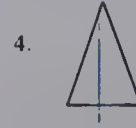
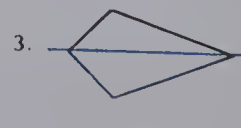
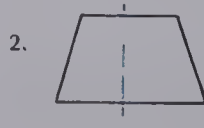


Unit 12 Objective	Test Questions	Pages
G1	6	266-267
G2	1-4	268-269
G3	8	270-271
G4	10	272-273
G5	5, 7, 9	274-275
G6	11-13	276-277
G7	14-15	278-279
G8	16-17	280-281
G9	18-20	282-283
G10	21-23	284-285

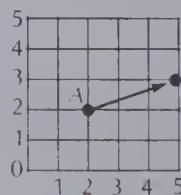
Pretest

Unit 12

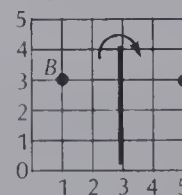
Draw a line of symmetry for each figure.



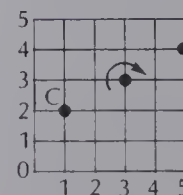
Identify the motion and the image



5. Slide



7. Flip



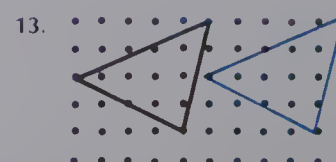
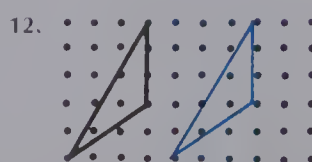
9. Turn

6. $A \rightarrow (5, 3)$

8. $B \rightarrow (5, 3)$

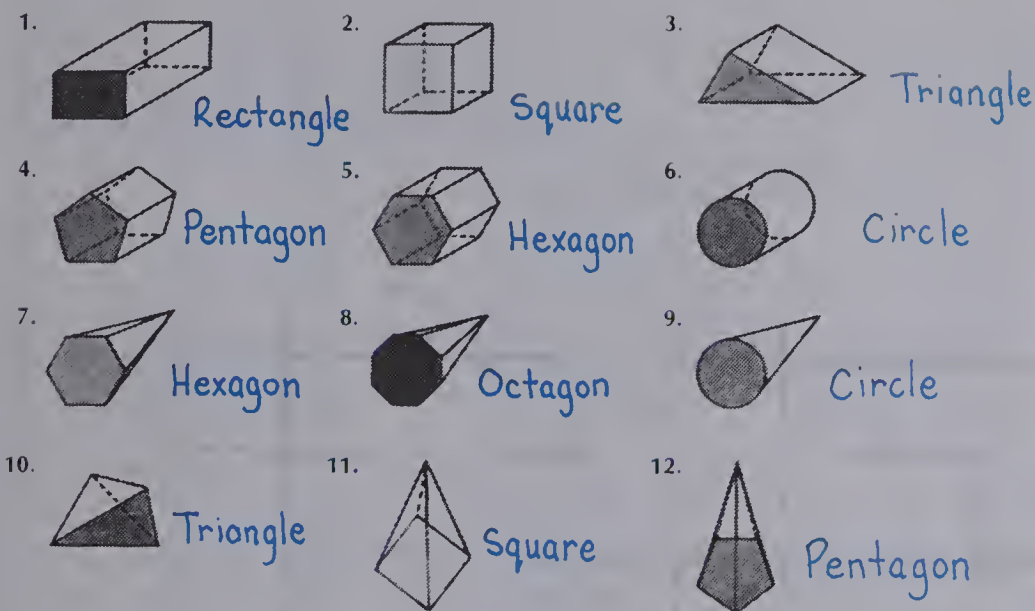
10. $C \rightarrow (5, 4)$

Draw a congruent triangle



Solids

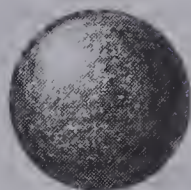
Name the coloured face of each solid.



13. Match these names with the solids shown above.
- | | |
|-------------------------------|---|
| a. cylinder 6 | b. cone 9 |
| c. cube 2 | d. triangular prism 3 |
| e. rectangular prism 1 | f. pentagonal prism 4 |
| g. hexagonal prism 5 | h. triangular pyramid (tetrahedron) 10 |
| i. square pyramid 11 | j. pentagonal pyramid 12 |
| k. hexagonal pyramid 7 | l. octagonal pyramid 8 |

14. Make a chart for all the solids shown above.
Record the number of faces, edges, and vertices for each solid

15. a. How many faces does a sphere have? ☐
b. How many edges does it have? ☐
c. How many vertices does it have? ☐



sphere

265

UNIT 12 PREVIEW

Suggestions

Have students look at the picture on page 264. Ask them what they notice about the picture. Have them name the solids and plane figures in the picture. Can they identify some of these shapes in the school building?

About the Page

Have the students study each solid, then ask them to describe each one. Ask, "How are numbers 7 to 12 different from 1 to 6?" *Numbers 7 to 12 have one sharp point.* "How do numbers 6 and 9 differ from the others?" *They each have a curved surface.* "How many pyramids are there on page 265?" *Five: 7, 8, 10, 11, and 12.* "How many prisms are there on page 265?" *Five: 1, 2, 3, 4, and 5.* "Describe a pyramid." *A solid with a polygonal base and one other vertex.*

Reinforcement

1. Provide a large variety of geometric solids. Have the students sort them into groups of pyramids, prisms, cones, and cylinders.

2. Have students look up the formal definition of a prism and of a pyramid.

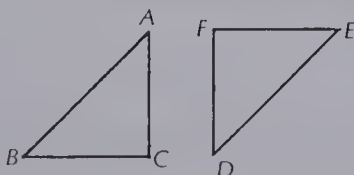
Enrichment

Ask the students to derive from the chart made in Question 14 a statement (equation) that relates the number of faces, vertices, and edges. ($E + 2 = V + F$)

The triangles are congruent.

14. Side AB corresponds to side DE

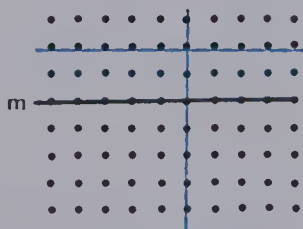
15. Vertex F corresponds to vertex C



16. Draw a line parallel to **m**.

17. Draw a line perpendicular to **m**

18. The sum of the angles in a triangle is 180.



Draw and label each.

19. right triangle

21. square

20. isosceles triangle

22. rectangle

23. parallelogram

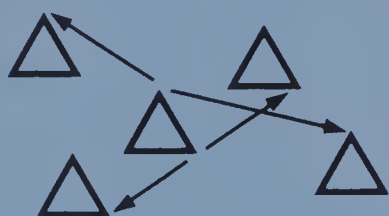
Objective G1

Describe a slide on a coordinate grid.

Introducing the Lesson

Place a cardboard triangle on the board and trace around it. Slide the triangle up and right and trace around it again. Point out that the second tracing is called the **slide image** of the first.

Ask, "Is the slide image (second triangle) the same as the first triangle?" Place the cardboard triangle in the first position and slide it in a number of different directions and trace. Ask, "Can you slide the triangle so that the slide image is different from the original shape?" Lead the students to conclude that shape is unchanged after a slide.

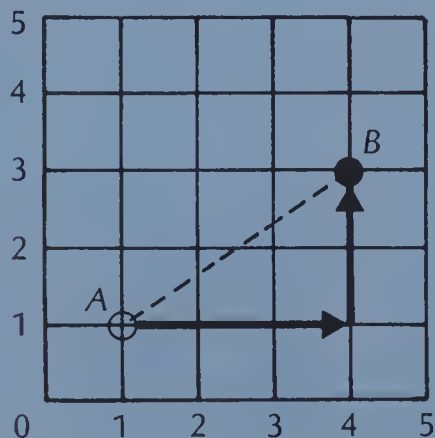


Teaching the Lesson

Place a triangle on the chalkboard. Illustrate how a single slide from lower left to upper right can be described as movement right, then movement up.

Repeat with other slides. Sketch a grid on the board and show how the grid is used to describe slides.

Point A is at (1, 1). If we slide *right* 3 places and *up* 2, we will be at point B, (4, 3). Point out how these two slides can be shown as a single slide indicated by a dotted arrow.



Discuss the sliding door example and the usefulness of a grid in describing the slide on page 266.

Slides

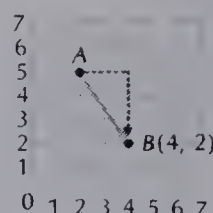
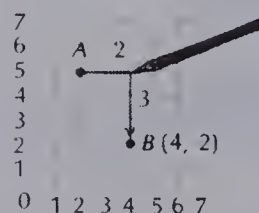
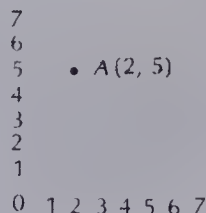
Marta is opening the patio door.

The motion of the door is called a **slide**.



Point A is at (2, 5) on the first grid.

When we *slide* 2 to the right and 3 down, we will be at point B, (4, 2).



The green arrow shows a single slide from A to B that we describe as 2 right, 3 down. Point B (4, 2) is called the **slide image** of point A.

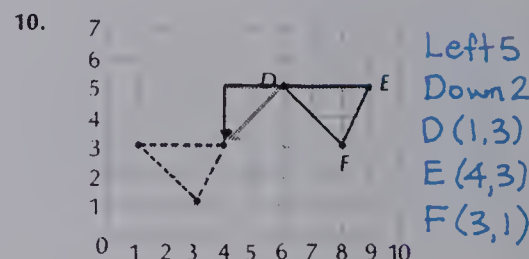
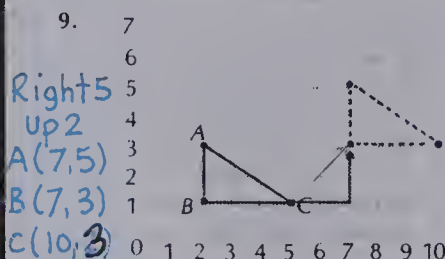
EXERCISES

What is the image of point A (2, 5) after each slide?

- right 3 (5, 5)
- right 3, down 2 (5, 3)
- right 4, down 3 (6, 2)
- right 4, down 4 (6, 1)
- left 1 (1, 5)
- left 1, down 1 (1, 4)
- left 1, up 1 (1, 6)
- right 3, up 2 (5, 7)

Describe each slide. (For example, \blacksquare left, \blacksquare down.)

Name the ordered pair of the slide image for each vertex.



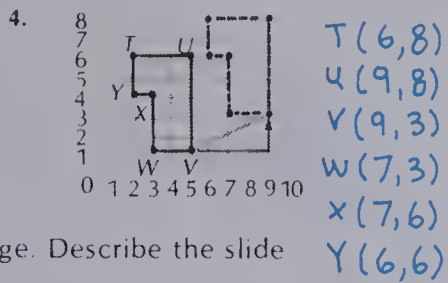
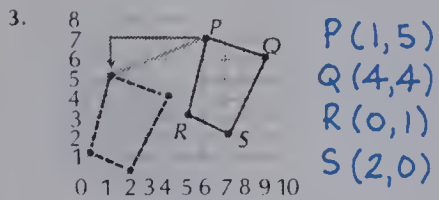
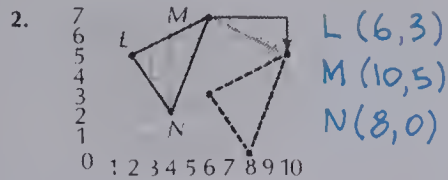
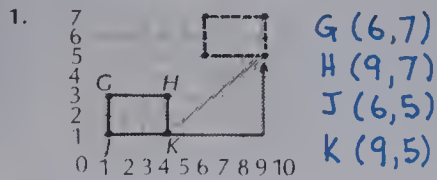
Using the Exercises

- Questions 1 to 8 require students to locate the image of A after a single slide, and then after a double slide.
- Questions 9 and 10 require students to describe slides illustrated in a diagram.

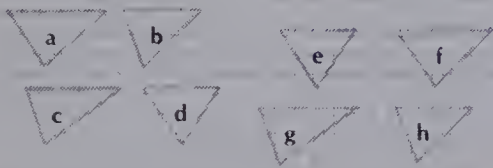
PRACTICE

Describe each slide.

Name the ordered pair of the slide image for each vertex.



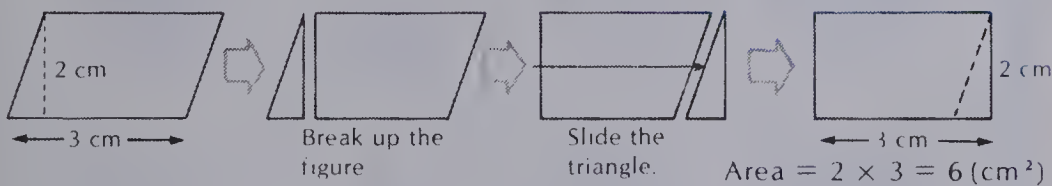
5. Trace triangle a. Find its slide image. Describe the slide. Repeat for triangles b, c, and d.



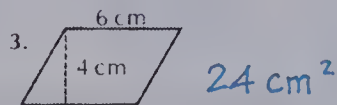
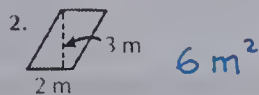
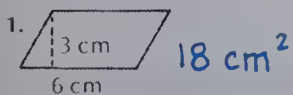
a → f right 20, down 1
 b → h right 14, down 5
 c → g right 12, down 1
 d → e right 7, up 3

Parallelogram Areas

Study the picture to find the area of the figure.



What is the area?



267

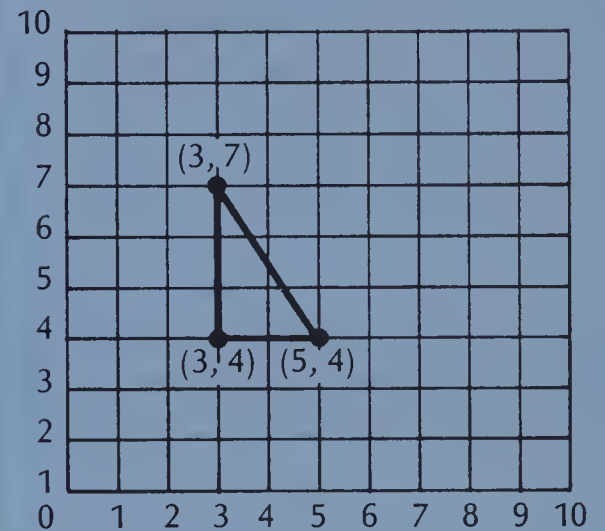
Assigning the Practice

Minimum: 1-4

Average: 1-5

Enriched: 1-5

Reinforcement



1. Slide the triangle right 3 and up 2. (Sketch the image.)

2. Slide the triangle left 2 and up 3. (Sketch the image.)

3. Slide the triangle right 3 and down 2. (Sketch the image.)

4. Is the slide that is right 4 and up 3 the same as one up 3 and right 4?

5. Is the slide that is right 4 and up 3 the same as one right 3 and up 4?

6. A point is moved from (2, 5) to (6, 2). Describe the slide on a grid.

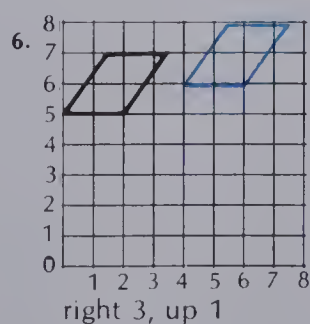
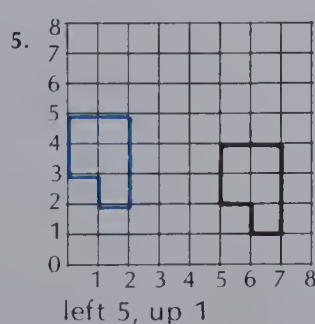
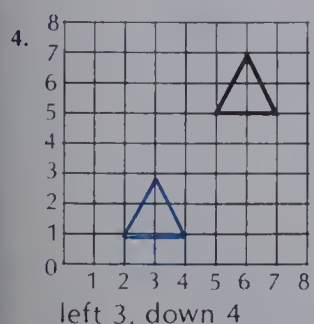
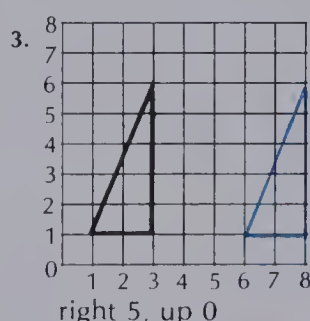
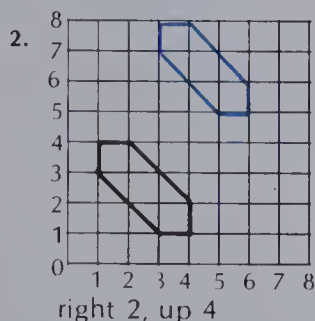
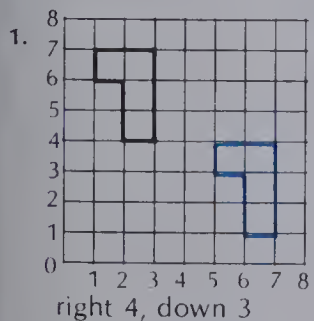
Enrichment

1. Assign *Parallelogram Areas* at the bottom of page 267.

2. Sketch a triangle with vertices located at (2, 2), (4, 2), and (4, 5). Slide the triangle right 3 and up 2. Name the vertices of the slide image.

Extra Practice

Draw the slide image.



Worksheet G1

Pages 266-267

UNIT 12 LESSON 2

Objective G2

Recognize figures with line symmetry.

Introducing the Lesson

Write the following words on the board and show how they are the same on both sides of the line. Ask students to make up other words that are the same on both sides of a line.

A
W
A
Y
-C-O-O-K-
-C-H-I-C-K-
W
H
A
T

Teaching the Lesson

From the above activity, introduce the words **symmetry** and **line of symmetry**. Point out that some words and letters have horizontal lines of symmetry and that others have vertical lines of symmetry. The letter X has two lines of symmetry. ✕ Ask if any other letters have two lines of symmetry. (H, I, O)

Discuss the introduction to symmetry on page 268. Point out that some geometric shapes have no lines of symmetry. Have students cut out a parallelogram and fold it to show it does not have a line of symmetry.



Provide students with equilateral triangles, hexagons, squares, and rectangles. Have students fold the figures to find the lines of symmetry. Have students make a triangle with one line of symmetry. Have them make a triangle with no lines of symmetry. If *MIRAs* are available, use them for testing symmetry as an easier alternative to tracing and folding.

You may want to discuss how some geometric solids have plane symmetry. That is, a plane separates the solid to form two matching halves.



cutting apple
in half

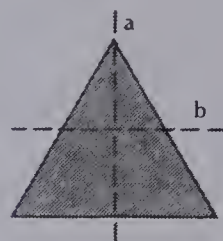
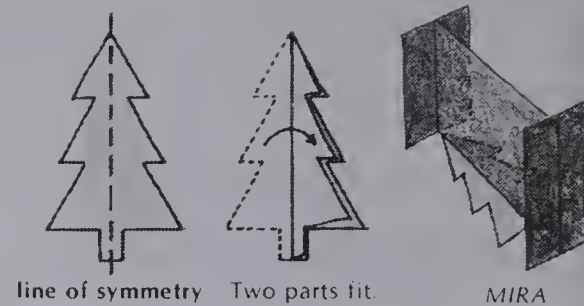


cutting cylinder,
blocks, balls in two

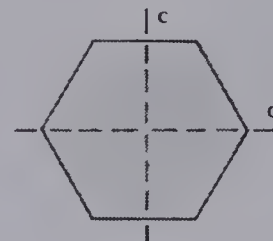
Some solids, such as pyramids and cones, do not have planes of symmetry.

Symmetry

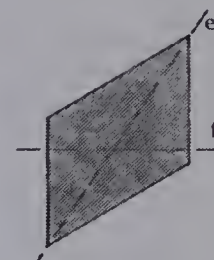
Trace the tree or use a *MIRA*. Fold the tracing (or place the *MIRA*) along the dotted line. If one part fits on the other, the picture has **line symmetry**. The crease is called a **line of symmetry**.



Line **a** is a line of symmetry.
Line **b** is **not** a line of symmetry.



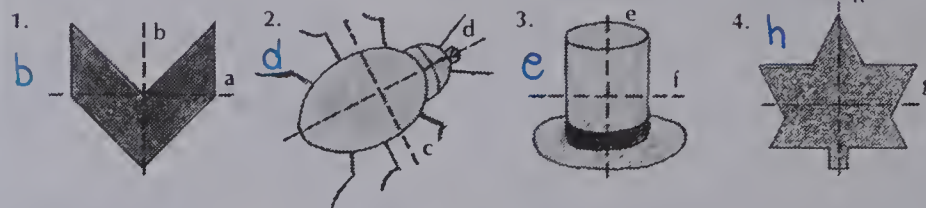
Lines **c** and **d** are both lines of symmetry.
This figure has other lines of symmetry.



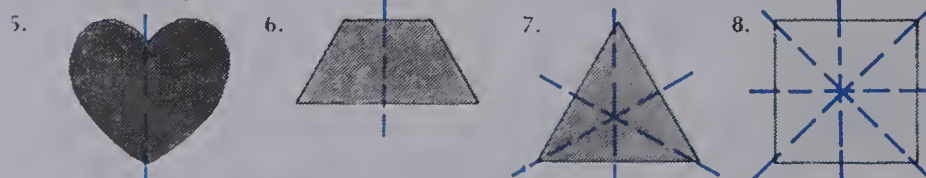
Neither line **e** nor **f** is a line of symmetry.

EXERCISES

Which line is a line of symmetry in each picture?



Trace each figure. Draw all the lines of symmetry.



268

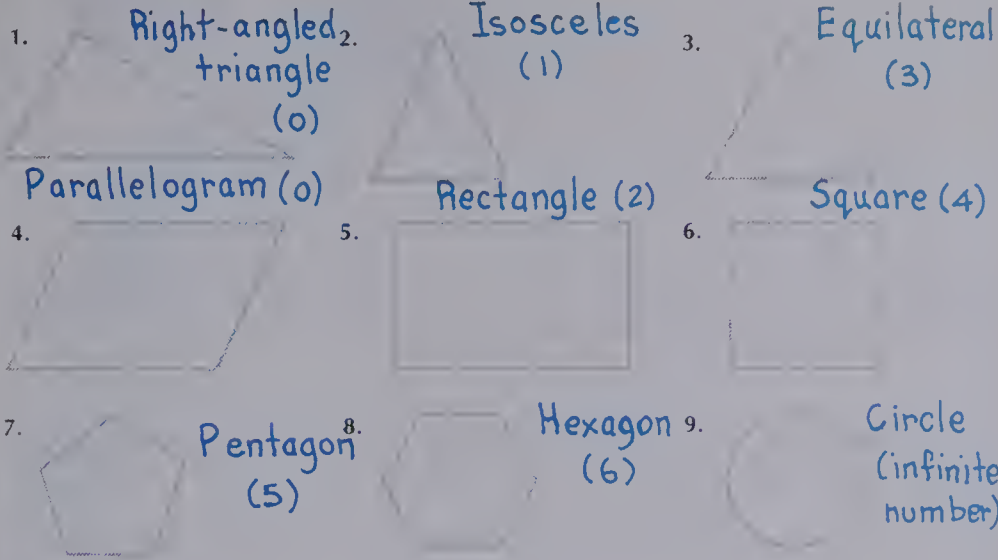
Using the Exercises

- Questions 1 to 4 require students to select the lines of symmetry shown in a drawing.
- Questions 5 to 8 require students to draw the lines of symmetry of given figures.

PRACTICE

Use tracings or a MIRA.

Name each figure and tell how many lines of symmetry it has.

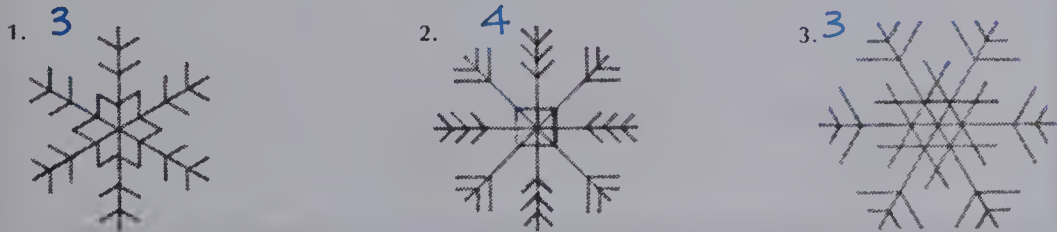


ABCDEFGHIJKLMNOPQRSTUVWXYZ

10. List the capital letters of the alphabet that have 1 line of symmetry.
A, B, C, D, E, K, M, T, U, V, W, Y
11. List the capital letters of the alphabet that have 2 lines of symmetry.
H, I, X
12. Do any letters have more than two lines of symmetry?
O
13. Which vowels have at least one line of symmetry? *A, E, I, O, U*

Snowflakes

How many lines of symmetry are there in each snowflake?



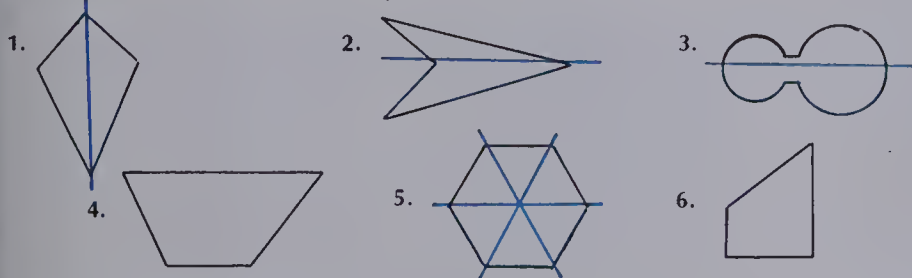
269

Extra Practice

Worksheet G2

Pages 268-269

Draw all the lines of symmetry.



7. List the capital letters that have horizontal lines of symmetry.
B, C, D, E, H, I, K, X
8. List the capital letters that have vertical lines of symmetry.
A, M, T, U, V, W, X, Y

Assigning the Practice

Minimum: 1-6

Average: 1-13

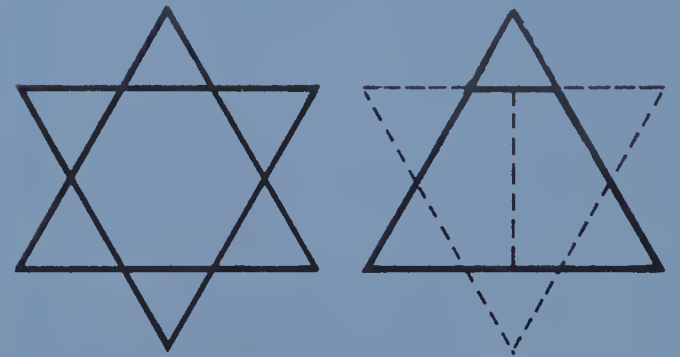
Enriched: 1-13

Reinforcement

1. Assign *Snowflakes* at the bottom of page 269.
2. Ask the students to sketch a:
 - a. triangle with no lines of symmetry.
 - b. triangle with one line of symmetry.
 - c. triangle with three lines of symmetry.
 - d. quadrilateral (4 sides) with no lines of symmetry.
 - e. quadrilateral with one line of symmetry.
 - f. quadrilateral with two lines of symmetry.
 - g. quadrilateral with four lines of symmetry.

Enrichment

1. How many lines of symmetry does a 6-pointed star have? 6



2. Identify all the polygons contained in the 6-pointed star and sketch their lines of symmetry.
3. How many lines of symmetry does a 5-pointed star have? 5
4. What geometric figure has the most lines of symmetry? *The circle has infinitely many.*

UNIT 12 LESSON 3

Objective G3

Describe a flip on a coordinate grid.

Introducing the Lesson

Write several capital letters on the board.

A B C D E F H

Place a mirror beside the letters and note that some letters look the same as their mirror image. "A" looks the same as its image. "B" does not look the same as its image. Try a few more letters.



Place the mirror below or above each capital letter in the alphabet. Discuss the letters and their mirror images.

Teaching the Lesson

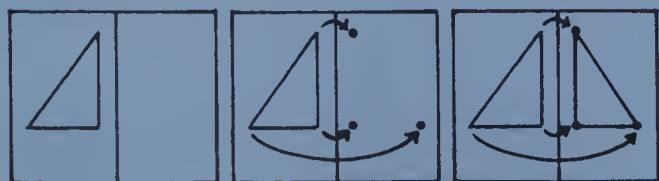
Sketch a capital letter A on the board and then draw a line as shown. Ask, "What would the image of A look like?" Sketch the image. Explain that the action is called a **flip**; that is, "A" has been flipped over the line.



Explain that the line is called the **flip line** and that the image is called the **flip image**.

Discuss the information on page 270. Stress that the points of the original figure match the points of the flip image. Point out that grid paper helps in locating and drawing flip images. Note that C and F are the same distance from the flip line as are B and E, A and D.

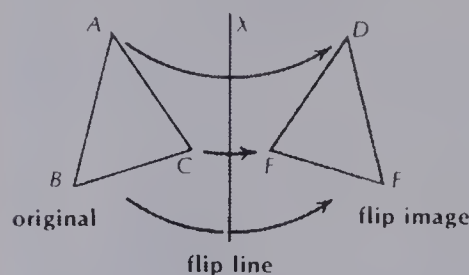
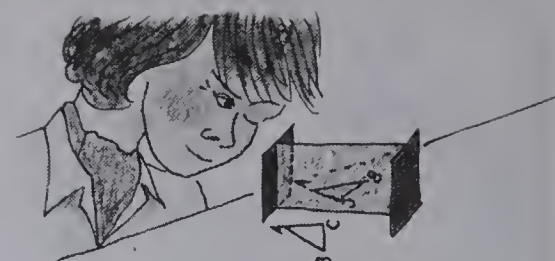
Give the students grid paper. Have them each draw a triangle, a flip line, and the flip image.



Again, placing a *MIRA* along the flip line is the simplest method of dealing with this objective.

Flips

We can **flip** a triangle over a line



Triangle DEF is the **flip image** of triangle ABC.

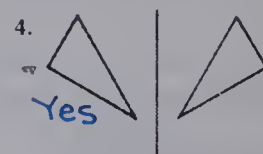
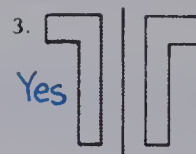
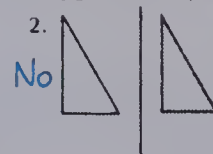
Point D is the image of A.
Point E is the image of B.
Point F is the image of C.

Using a grid, check the distance of each point from the flip line

A and D are 3 units from the flip line.
B and E are 4 units from the flip line.
C and F are 1 unit from the flip line.

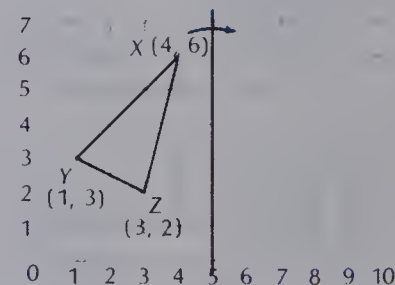
EXERCISES

Does the diagram suggest a flip?



5. Name the ordered pairs for the vertices of the flip image of triangle XYZ over the black line.

X (6,6)
Y (9,3)
Z (7,2)



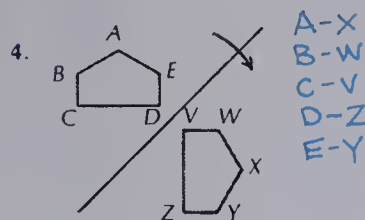
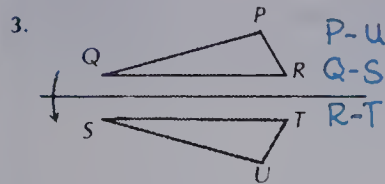
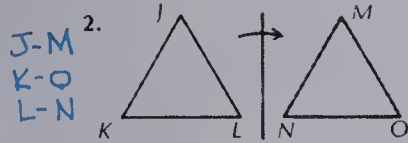
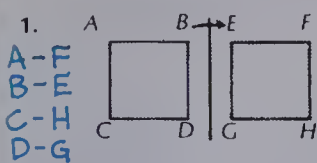
270

Using the Exercises

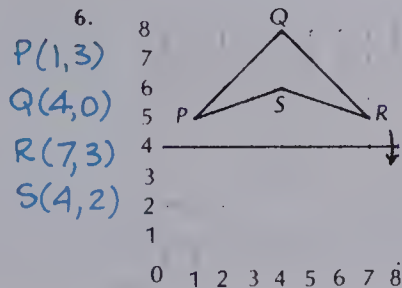
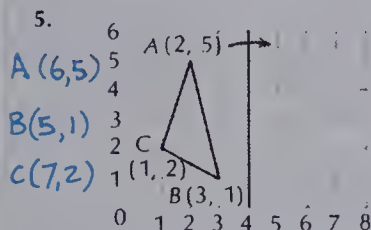
- Questions 1 to 4 require the students to select the diagram that shows a flip.
- Question 5 requires the students to use ordered pairs to name the vertices of a flipped triangle.

PRACTICE

Name the matching pairs of points for each object and its flip image.



Name the ordered pair for each vertex of the flip image.



Palindromes and Flips

A palindrome is a word or phrase that is spelled the same backwards and forwards.

ANNA

PEEP

NEVER ODD OR EVEN

Some palindromes can be flipped and still look the same.

OTTO|OTTO AVA|AVA MOM|MOM

Make up other palindromes.

Try to make more palindromes that look the same when flipped.

271

Assigning the Practice

Minimum: 1-4

Average: 1-6

Enriched: 1-6

Reinforcement

Have the students draw polygons on grid paper. Then they draw a flip line and the flip image.

They may also label coordinate axes and write ordered pairs for the vertices of the polygons and their images.

Enrichment

1. Assign *Palindromes and Flips* at the bottom of page 271. Some other palindromes are:

ABLE WAS I ERE I SAW ELBA.

EVADE DAVE.

MADAM, I'M ADAM.

STEP ON NO PETS.

SIT ON A POTATO PAN, OTIS.

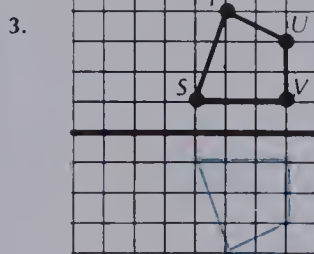
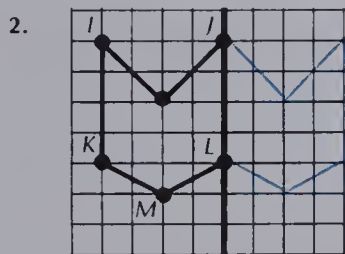
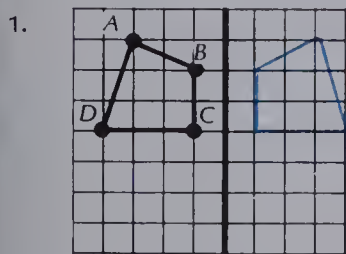
2. Investigate the result of two successive flips over parallel lines.



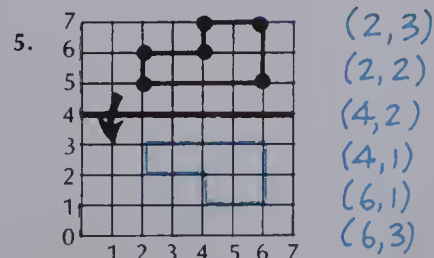
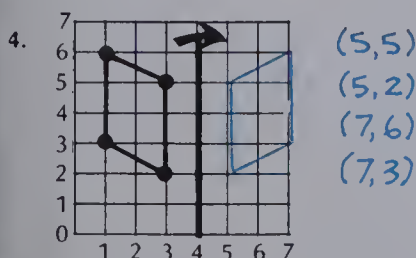
The final image is also a *slide* image of the first. Have students investigate and report on results of other combinations of flips (e.g., over perpendicular lines).

Extra Practice

Draw the flip image.



Label each vertex of the flip image with its ordered pair.



Worksheet G3

Pages 270-271

UNIT 12 LESSON 4

Objective G4

Describe a turn on a coordinate grid.

Introducing the Lesson

Make up block letter cards like this.



Show students the H card. Ask them to close their eyes and turn the card

$\frac{1}{4}$ turn.



Ask them to open their eyes and tell what happened.

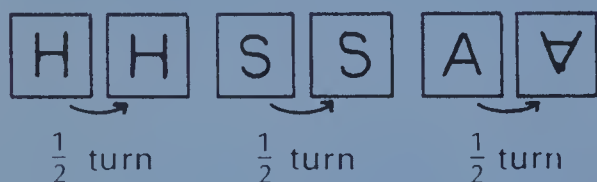
Have them close their eyes again and make another $\frac{1}{4}$ turn.



Ask them to open their eyes and tell what happened.

Repeat this procedure with the S and A cards.

Have students study the following. What do they notice?



H and S are the same after a $\frac{1}{2}$ turn. A is upside down.

Teaching the Lesson

Stick a pin in the centre of the above letters to explain and illustrate the **turning point** of each move.

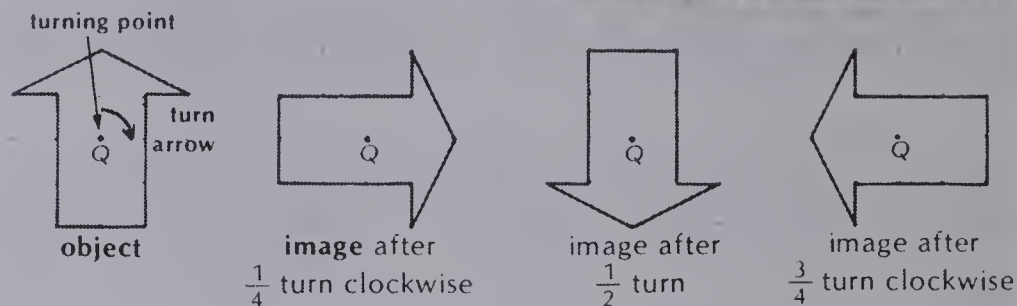
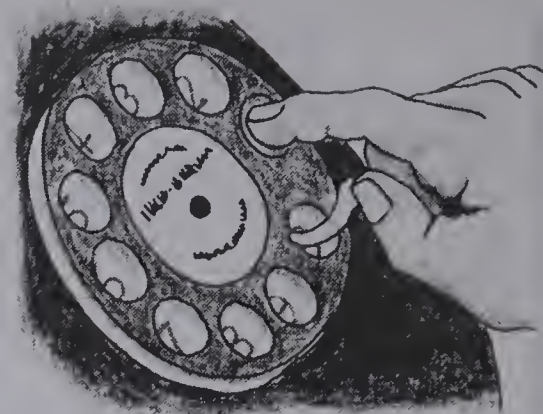
Discuss the introduction on page 272. Have students identify the turning point. Explain how the arrow indicates the direction of the turn. Review the meaning of **clockwise**. You may want to show that $\frac{1}{2}$ turn clockwise is the same as $\frac{1}{2}$ turn counterclockwise, and that $\frac{3}{4}$ turn clockwise is the same as $\frac{1}{4}$ turn counterclockwise.

Turns

A figure can **turn** about a point.

These pictures show the images of a figure being turned **clockwise**.

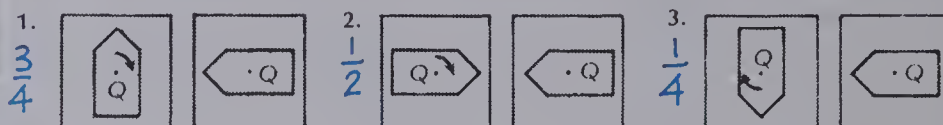
Q is the **turning point**.



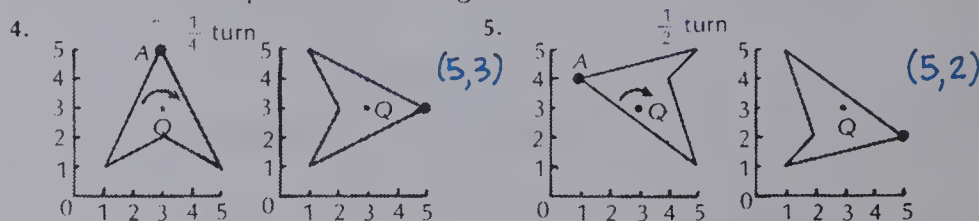
After a **full turn**, the image will be back in the same position as the object.

EXERCISES

Write $\frac{1}{4}$ turn, $\frac{1}{2}$ turn, or $\frac{3}{4}$ turn for each clockwise turn about Q



Write the ordered pair for the image of A.

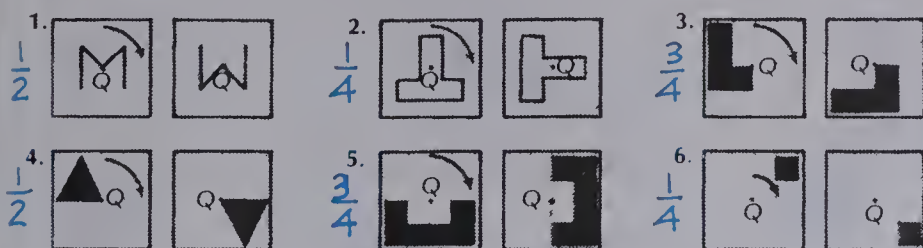


Using the Exercises

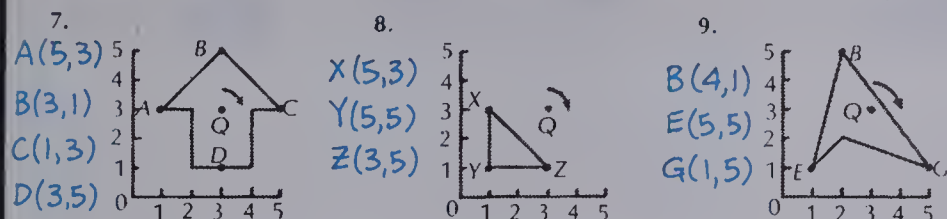
- Questions 1 to 3 require students to identify $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ turns of a figure.
- Questions 4 and 5 require students to name coordinates of a point after a $\frac{1}{4}$ or $\frac{1}{2}$ turn.

PRACTICE

Write $\frac{1}{4}$ turn, $\frac{1}{2}$ turn, or $\frac{3}{4}$ turn for each clockwise turn about Q.



Write the ordered pair for each point after a half turn about Q.



90°

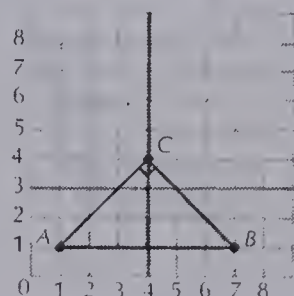
180°

270°

10. What is the size of the angle in a $\frac{1}{4}$ turn? a $\frac{1}{2}$ turn? a $\frac{3}{4}$ turn?

REVIEW

- Name the ordered pair for the image of point A after a slide of right 1, up 4. **(2,5)**
- Which is a line of symmetry for triangle ABC: the green line or the red line? **Red**
- Name the ordered pair for the image of A after a flip over the green line. **(1,5)**
- Name the ordered pair for the image of B after a $\frac{1}{4}$ turn clockwise about C. **(1,1)**



273

Assigning the Practice

Minimum: 1-6

Average: 1-9

Enriched: 1-10

Review Exercises

Questions	Objective	Pages
1	G1	266-267
2	G2	268-269
3	G3	270-271
4	G4	272-273

Reinforcement

1. Ask the students to sketch the image of T after a $\frac{1}{4}$ turn, $\frac{1}{2}$ turn, and $\frac{3}{4}$ turn.

2. Have the students complete.

A turn of 90° is a $\frac{1}{4}$ turn. ($\frac{90}{360} = \frac{1}{4}$)

A turn of 180° is a ____ turn.

A turn of 270° is a ____ turn.

A turn of 360° is a ____ turn.

A turn of 60° is a ____ turn.

A turn of 120° is a ____ turn.

A turn of 240° is a ____ turn.

3. Ask the students to list the capital letters in the alphabet that look the same after a $\frac{1}{2}$ turn.

Enrichment

1. Sketch a picture of a figure to show that a $\frac{1}{2}$ turn clockwise gives the same image as a $\frac{1}{2}$ turn counterclockwise.

2. Sketch a picture of a figure to show that a $\frac{1}{4}$ turn clockwise gives the same image as a $\frac{3}{4}$ turn counterclockwise.

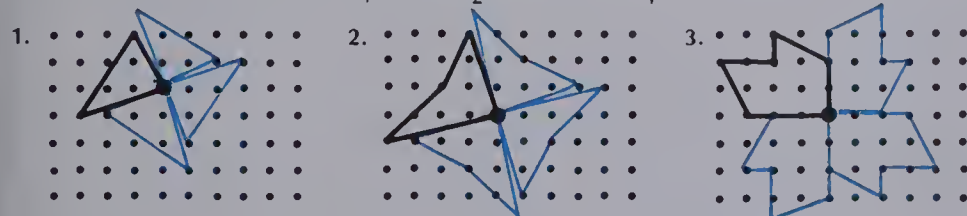
3. Sketch the image of \triangle after $\frac{1}{4}$ turn clockwise, $\frac{1}{2}$ turn clockwise, $\frac{3}{4}$ turn clockwise, $\frac{1}{3}$ turn clockwise, $\frac{2}{3}$ turn clockwise.

Extra Practice

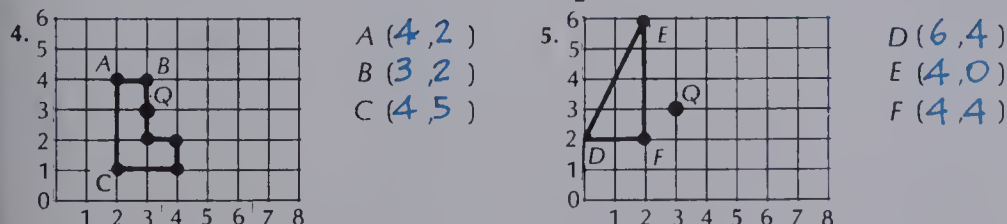
Worksheet G4

Pages 272-273

Draw the turn image after $\frac{1}{4}$ turn, $\frac{1}{2}$ turn, and $\frac{3}{4}$ turn.



Write the ordered pair for each point after $\frac{1}{2}$ turn about Q.

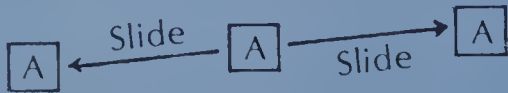


Objective G5

Identify slides, flips, and turns on coordinate grids.

Introducing the Lesson

Print a large "A" on a transparency sheet. Have students place the sheet on the desk top and show that the letter looks the same as its slide image.



Have students flip the A over a line. Ask, "Does the flip image look like the original A?"



Have students place a finger in the middle of the sheet and then turn it $\frac{1}{2}$ turn clockwise. Ask, "Does the turn image look like the original A?"



Have students print their first initial on a card and see if its flip image or turn image is the same as the original letter.

Teaching the Lesson

Discuss the information on page 274. Explain how point A matches with B after the slide.

$$A(4, 1) \rightarrow B(6, 4)$$

Have students study the slide and complete the following matchings.

$$\begin{aligned} (2, 3) &\rightarrow (\quad , \quad) & (3, 2) &\rightarrow (\quad , \quad) \\ (3, 3) &\rightarrow (\quad , \quad) & (4, 2) &\rightarrow (\quad , \quad) \end{aligned}$$

Have students study the flip. Point out the flip line. Explain that point C matches with point D, and that C and D are the same distance from the flip line. Have students complete the following matchings.

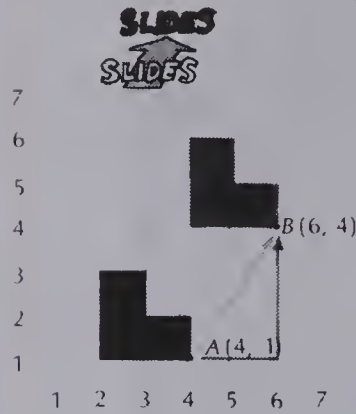
$$\begin{aligned} (1, 2) &\rightarrow (\quad , \quad) & (2, 3) &\rightarrow (\quad , \quad) \\ (1, 4) &\rightarrow (\quad , \quad) & (3, 3) &\rightarrow (\quad , \quad) \\ (2, 4) &\rightarrow (\quad , \quad) \end{aligned}$$

Discuss the turn example and explain that point E matches point F. Have students complete the following matchings.

$$\begin{aligned} (1, 3) &\rightarrow (\quad , \quad) & (3, 2) &\rightarrow (\quad , \quad) \\ (2, 2) &\rightarrow (\quad , \quad) & (3, 1) &\rightarrow (\quad , \quad) \\ (2, 3) &\rightarrow (\quad , \quad) \end{aligned}$$

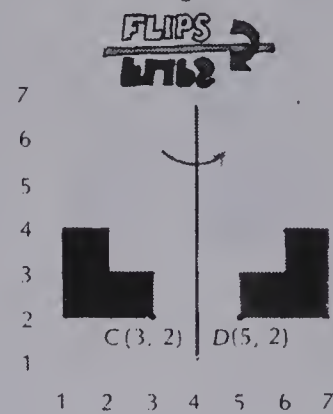
Slides, Flips, and Turns

In each picture, the red figure is the image of the black figure.



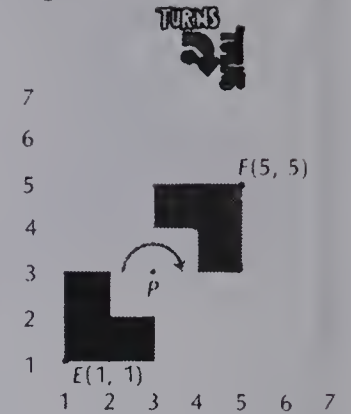
This image results from a slide of right 2, up 3

$$A(4, 1) \rightarrow B(6, 4)$$



This image results from a flip over the black line

$$C(3, 2) \rightarrow D(5, 2)$$



This image results from a $\frac{1}{2}$ turn about point P.

$$E(1, 1) \rightarrow F(5, 5)$$

Is the image produced by a slide, flip, or turn?

1. Flip
2. Turn
3. Slide
4. Slide
5. Flip
6. Turn

Using the Exercises

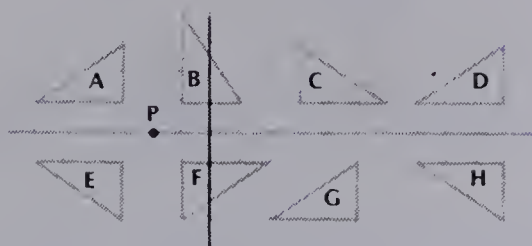
- Questions 1 to 6 require students to identify slides, flips, and turns.

Practice

Is the image produced by a slide, flip, or turn?



Find the image of triangle A after these motions.



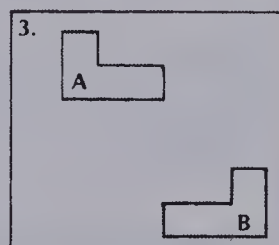
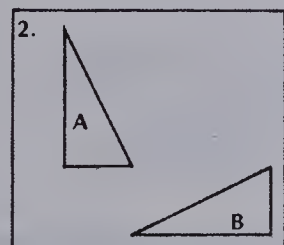
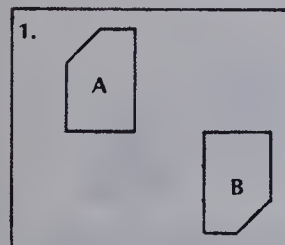
4. after a flip over the red line **C** 5. after a slide to the right **D**
 6. after a $\frac{1}{2}$ turn about P **F** 7. after a slide of right 8, down 4 **G**
 8. after a flip over the green line **E** 9. after a $\frac{1}{4}$ turn clockwise about P **B**

Special Combinations



Figure B is the image of figure A after a turn **and** then a flip.

How is figure B produced from figure A in each diagram?



Assigning the Practice

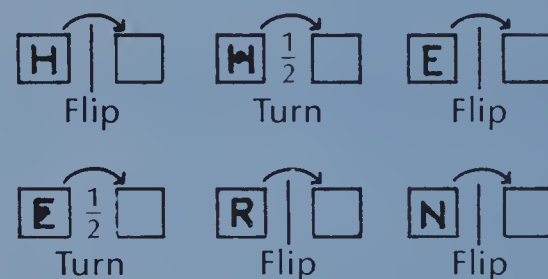
Minimum: 1-3

Average: 1-9

Enriched: 1-9

Reinforcement

Draw the image after the indicated move.



1. List all the letters that look the same as their image after a flip over a vertical flip line.

2. List all the letters that look the same as their turn image after a $\frac{1}{2}$ turn.

3. List the letters that satisfy *both* situations in problems 1 and 2.

Enrichment

1. Assign *Special Combinations* at the bottom of page 275. There are many acceptable answers for each question. Check the students' combinations.

2. Have the students investigate "commutativity" of motions by following this procedure. Draw a triangle, perform a slide, and then a flip. Perform the flip first and then the slide. Are the images the same? *No* Try other combinations of slides, flips, and turns.

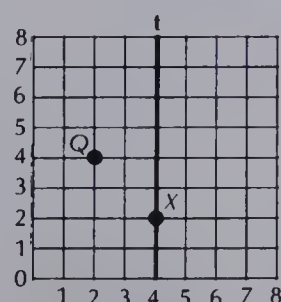
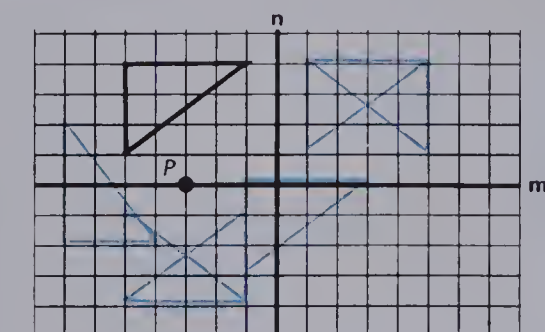
Extra Practice

Draw the image of the triangle after each motion.

- flip over line m
- slide right 6
- slide right 4, down 4
- $\frac{1}{2}$ turn about P
- flip over line n
- $\frac{3}{4}$ turn clockwise about P

Name the coordinates of the image of Q

- slide right 3, down 2 **5(5,2)**
- flip over line t **(6,4)**
- $\frac{1}{2}$ turn about x **(6,0)**



Worksheet G5

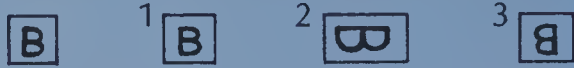
Pages 274-275

Objective G6

Identify congruent triangles.

Introducing the Lesson

Sketch the following on the board.



Ask, "What would you have to do with B so that its image looks like 1, 2, and 3?"

Discuss how the B would fit exactly over 1 by sliding it, on 2 by turning it, and on 3 by flipping it.

Explain that the B is **congruent** to the Bs in 1, 2, and 3, and that congruent means **same size and same shape**.

Show examples of non-congruent letters.

BB
different
size

Bb
different
shape

Ask students to print two letters that are congruent and two that are not congruent.

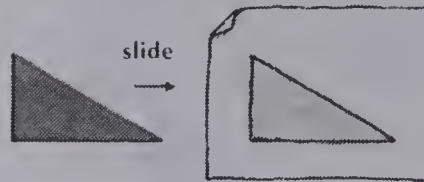
Teaching the Lesson

Discuss the introduction on page 276. Have students place a sheet of paper over the orange triangles and trace them; then check for congruence by sliding, flipping, and turning the traced triangle.

Have students sketch a triangle that has sides of length 8 cm, 8 cm, and 8 cm; then ask them to compare their triangles and find a triangle congruent to the one they drew. Have them check congruence after sliding, flipping, and turning. *All will be congruent.*

Congruence

If a tracing of a figure fits exactly on a second figure, then the two figures are **congruent**.

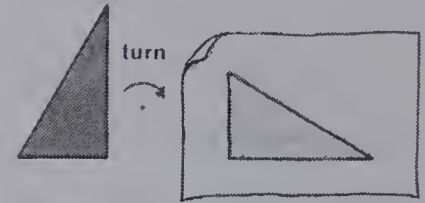


Trace the first triangle and **slide** the tracing over the second triangle. If it fits, the triangles are congruent.



Trace the first triangle and **flip** the tracing onto the second triangle. If it fits, the triangles are congruent.

Trace the first triangle and **turn** the tracing onto the second triangle. If it fits, the triangles are congruent.



The tracing can be moved through any combination of slides, flips, and turns to test for congruence.

EXERCISES

Using tracings to test for congruence.

1. Yes
2. Yes
3. Yes
4. Yes
5. No
6. Yes

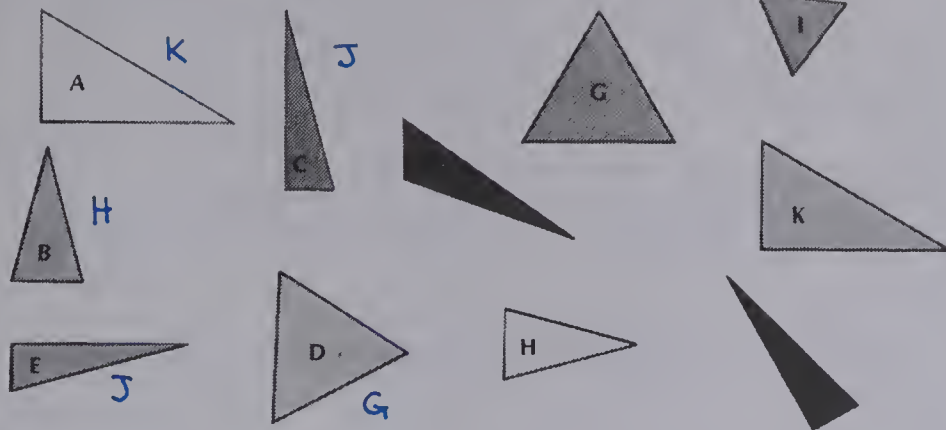
276

Using the Exercises

- Questions 1 to 6 require students to test congruence by tracing.

Practice

- Use tracings to find congruent triangles



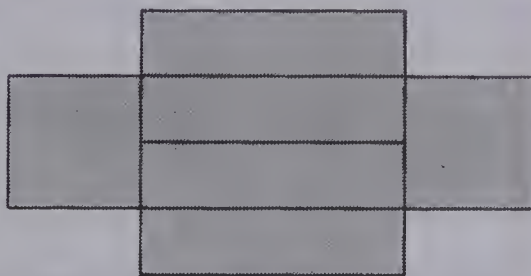
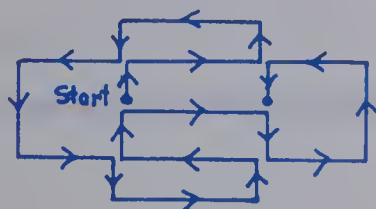
- Which triangle is a slide image of the first triangle? (Use tracing paper.) Which is the flip image? Which is the turn image?



- Draw a right triangle on grid paper. Then draw a triangle that is the slide image of the first triangle.
- Draw another right triangle. Then draw a triangle that is its flip image.
- Draw another right triangle. Then draw a triangle that is its turn image.

Tracing Challenge

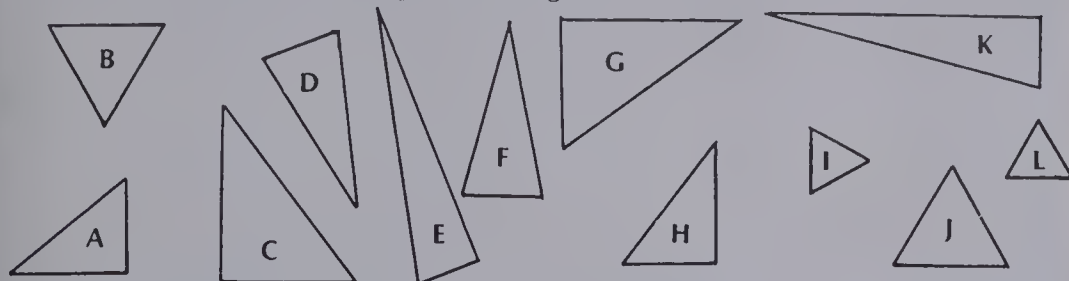
Trace the figure without lifting your pencil from the paper and without retracing any lines.



277

Extra Practice

Trace and match pairs of congruent triangles.



- $A + H$
- $D + F$
- $B + J$
- $E + K$
- $C + G$
- $I + L$

Worksheet G6

Pages 276-277

Assigning the Practice

Minimum: 1-2

Average: 1-5

Enriched: 1-5

Reinforcement

1. Ask, "Does your left hand look like a slide, flip, or turn image of your right hand?" *Flip.*

2. Select pairs of things in the room that look like slide images, flip images, and turn images.



These doors are flip images.



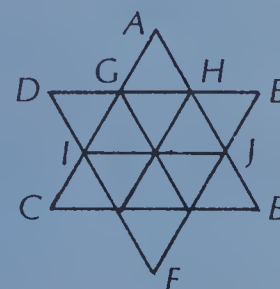
These doors are slide images.

3. Ask, "Are all right angles congruent?" Yes.

Enrichment

1. Assign *Tracing Challenge* at the bottom of page 277.

2. Assign these star questions:



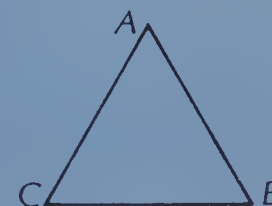
a. How many triangles are congruent to



b. How many triangles are congruent to



c. How many triangles are congruent to

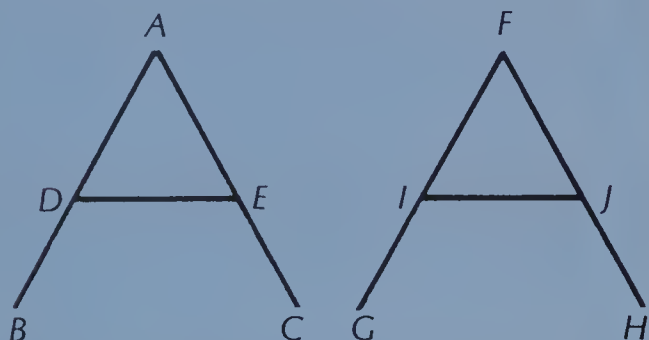


Objective G7

Name corresponding parts (sides, angles, and vertices) of congruent triangles.

Introducing the Lesson

Sketch two large congruent capital As on the board and label the vertices.



- Ask a student to use a straightedge and compare legs AC and FH . Lead the students to conclude that AC and FH are congruent. Ask them, "What other lines are congruent?"
- Ask a student to compare angles DAE and IFJ . Lead the students to conclude that the angles are congruent. Ask, "What other angles are congruent?"
- Ask a student to compare the triangles in the two As. Ask, "Are they congruent? How do you know?"

Teaching the Lesson

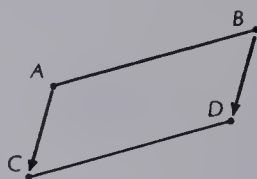
Have students write the definition of congruent: "Two figures are congruent if they are the same size and shape."

Discuss the introduction on page 278. Ask, "Are all line segments that are the same length congruent?" Yes. Ask students to draw a line segment congruent to AB .

Point out that the points of congruent figures match. Note the meaning of **corresponding parts**.

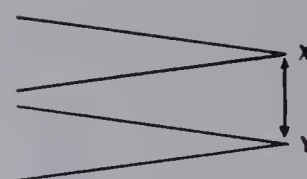
In the two triangles, ask students to name the parts that correspond with: points N, M, O ; sides MN, MO, NO ; angles NMO, MNO, NOM .

Congruence



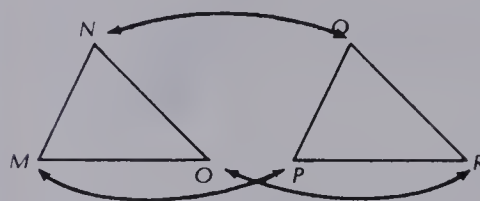
congruent segments

Point A matches point C.
Point B matches point D.



congruent angles

Angle X matches angle Y.



congruent triangles

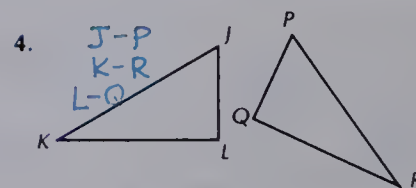
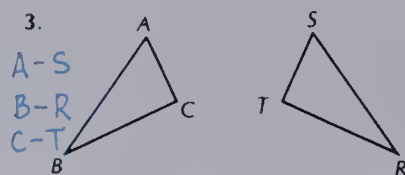
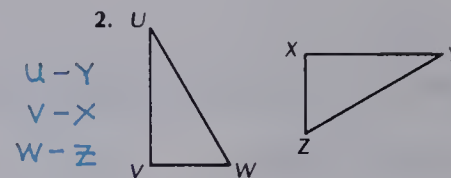
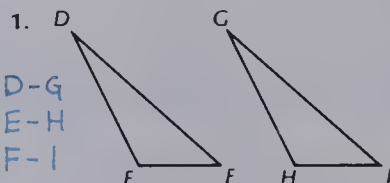
Matching vertices and angles: M and P
 N and Q
 O and R

Matching sides: MN and PQ
 NO and QR
 MO and PR

Matching parts of congruent figures are called **corresponding parts**.

EXERCISES

Name the corresponding vertices, angles, and sides in each pair of congruent triangles.

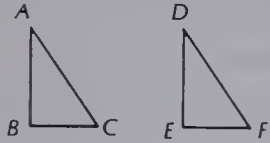


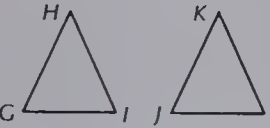
Using the Exercises

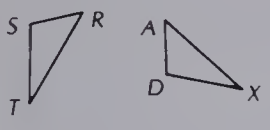
- Questions 1 to 4 require students to apply the concept of corresponding parts. If students are having difficulty, they should make tracings, label the vertices, and fit the tracings over the congruent triangles.

PRACTICE

Study the congruent triangles and complete the statements.

- 

Segment AB is congruent to \blacksquare DE
 Angle C is congruent to \blacksquare $\text{Angle } F$
 Triangle ABC is congruent to \blacksquare $\triangle DEF$
- 

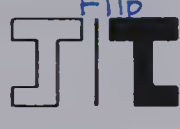
Segment GI is congruent to \blacksquare JL
 Angle K is congruent to \blacksquare $\text{Angle } H$
 Triangle JKL is congruent to \blacksquare $\triangle GHI$
- 

Segment RT is congruent to \blacksquare AX
 Angle R is congruent to \blacksquare $\text{Angle } A$
 Triangle RST is congruent to \blacksquare $\triangle ADX$
- Guess and test: In triangles ABC and DEF , sides AB and DE are congruent. Angles A and D are congruent. Angles B and E are congruent. Are the two triangles congruent? Yes

REVIEW

Is the red figure a slide image, a flip image, or a turn image?


- 

Slide
- 

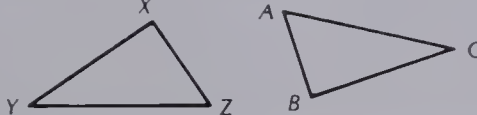
Flip
- 

Turn

4. Which triangle is congruent to the first one?

- b. 

5. Name one pair of corresponding sides.

- AC and YZ 

279

Assigning the Practice

Minimum: 1-2

Average: 1-3

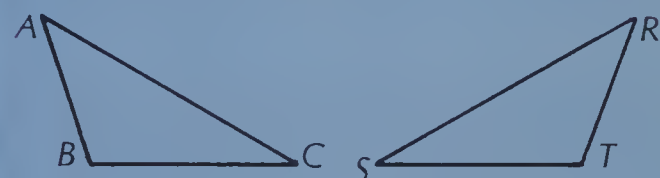
Enriched: 2-4

Review Exercises

Questions	Objective	Pages
1-3	G5	274-275
4	G6	276-277
5	G7	278-279

Reinforcement

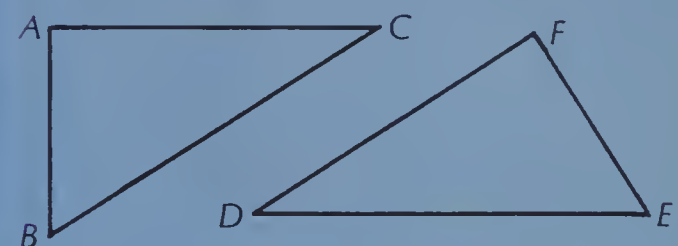
1. Ask the students to use the word *congruent* and write 7 true statements about the two triangles.



2. Ask the students to use the word *corresponds* and write 5 true statements about the two triangles.

Enrichment

Assign the following exercises.
 Triangles ABC and DEF are congruent.



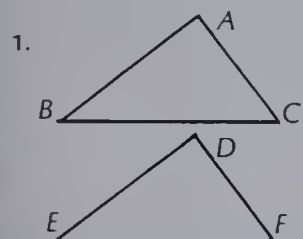
AB measures 6 cm.
 AC measures 8 cm.
 DE measures 10 cm.

Angle A measures 90° .
 Angle B measures 53° .
 Angle D measures 47° .

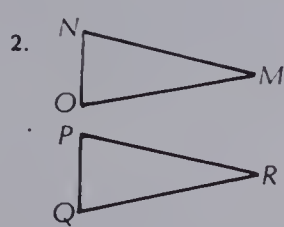
- BC measures _____.
- DF measures _____.
- FE measures _____.
- Angle E measures _____.
- Angle F measures _____.
- Angle C measures _____.

Extra Practice

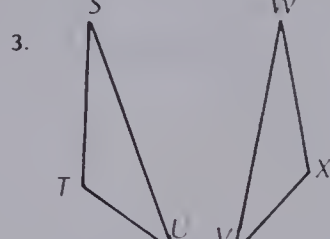
Name the corresponding parts in the congruent triangles.



side AB side DE
 side BC side EF
 side AC side DF



vertex M vertex R
 vertex N vertex P
 vertex O vertex Q
 angle O angle Q
 side ON side QP



vertex T vertex X
 side SU side WV
 angle U angle V

Worksheet G7

Pages 278-279

Objective G8

Label angles and recognize perpendicular and parallel lines.

Introducing the Lesson

Sketch these pictures on the board.



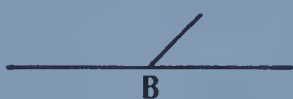
Ask a student to redraw the pictures to correct them or make them look like a normal door, pole, or book. Have students study the new drawings. Ask, "How are they different from the above pictures?"

Teaching the Lesson

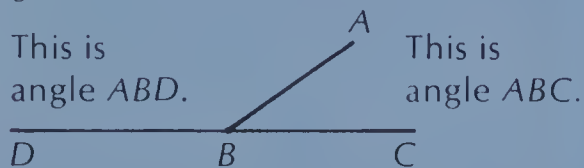
Until now we have used one letter to label an angle.

B angle B

Point out that this is not always enough to identify the angle we mean. Which is angle B?



So we use 3 letters to define a unique angle.



Have students make an angle such that the math text will fit into the angle as shown in the picture on page 280.



Point out that this angle measures 90° . Discuss the other examples of **perpendicular** lines.

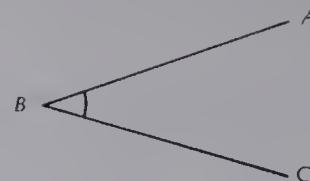
Have students place straws like this.



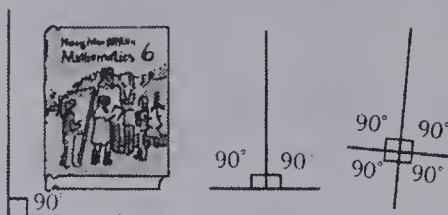
Point out that the straws are an equal distance apart at all points. Explain that the straws are **parallel**. Discuss how opposite sides of a door (window, wall, etc.) are parallel. (Even the l's in parallel are parallel!)

Lines and Angles

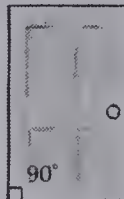
Line segments AB and BC meet (intersect) to form angle ABC.



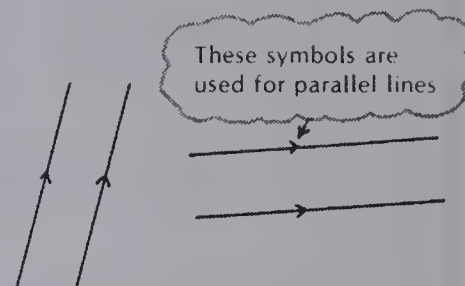
When two lines intersect at right angles, they are called **perpendicular** lines. They form 90° angles.



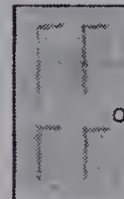
The bottom of a door and one side of the door are **perpendicular**.



When two lines will never intersect, they are called **parallel** lines.



The opposite edges of a door are **parallel**.



EXERCISES

Write a statement about each figure, such as "AB is parallel to CD."

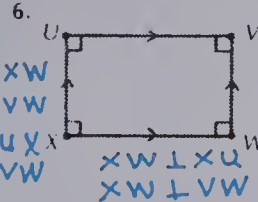
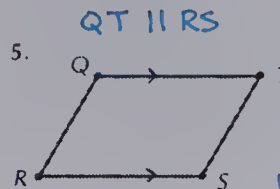
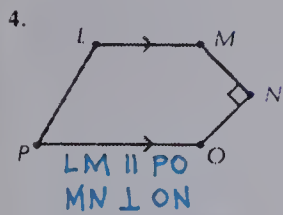
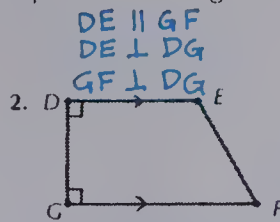
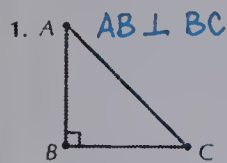
- $EF \perp GH$
- $PQ \parallel RS$
- $LM \parallel NO$
- $ZY \perp YX$
- $RS \perp ST$
- UV not $\parallel WX$
- $DE \perp EF$
- $JK \parallel ML$

Using the Exercises

- Make sure students are using the words *parallel* and *perpendicular* properly. If they have any problems with questions 6 and 8 (JM and KL), have them trace and extend the lines until they meet so that students recognize that the segments are *not* parallel.

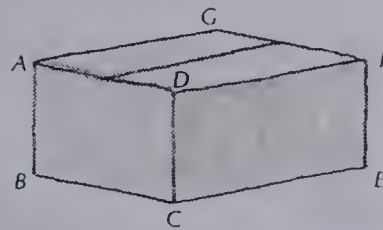
PRACTICE

In each figure, name the perpendicular segments and the parallel segments



Complete each statement. (Use a real box and label the vertices.)

7. a. Segments CD and DF are \perp
- b. Segments CD and EF are \parallel
- c. Segments CE and DF are \parallel
- d. Segments AB and CD are \parallel
- e. Segments AB and BC are \perp
- f. Segments AG and GF are \perp
- g. Segments AG and CE are \parallel



MIRA Constructions

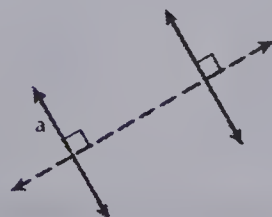
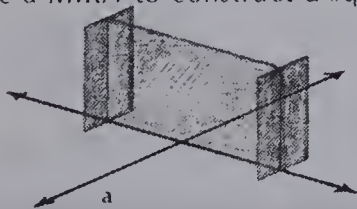
Draw a line and label it a

Use a MIRA to construct a line perpendicular to a.

Use a MIRA to construct a line parallel to a.

Use a MIRA to construct a rectangle.

Use a MIRA to construct a square.



281

Assigning the Practice

Minimum: 1-6

Average: 1-7

Enriched: 1-7

Reinforcement

1. Have the students use a geoboard and two elastic bands to construct four pairs of parallel lines.

2. Have the students use a geoboard and two elastic bands to construct four pairs of perpendicular lines.

3. Have the students use a geoboard and one elastic band to make a:

a. four-sided figure with one pair of perpendicular sides.

b. four-sided figure with two pairs of perpendicular sides.

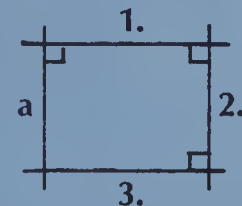
c. four-sided figure with three pairs of perpendicular sides.

d. four-sided figure with one pair of parallel sides.

e. four-sided figure with two pairs of parallel sides.

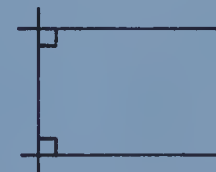
Enrichment

Assign *Mira Constructions* at the bottom of page 281. The illustrations give a clue to the first two constructions. A rectangle can be constructed by drawing successive perpendicular lines.

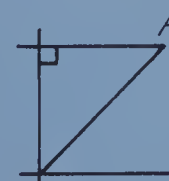


The square is more challenging and should be given only to the most advanced students. It involves recognizing properties of the diagonals. They bisect the angles at the vertices.

a. Construct perpendicular lines.



b. Use MIRA to bisect an angle.



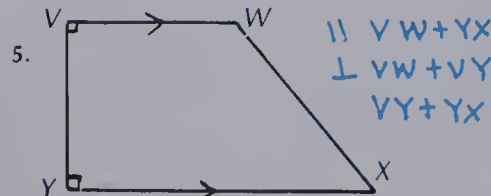
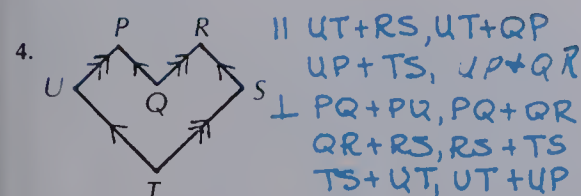
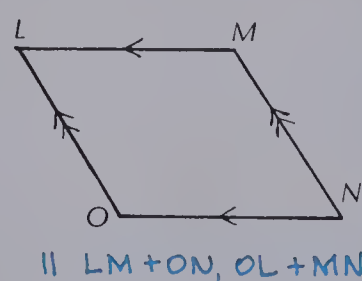
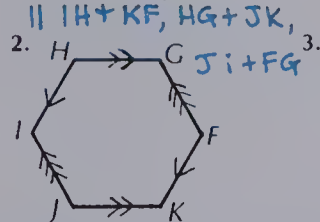
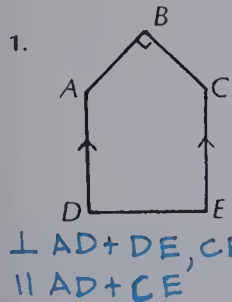
c. Finally, construct a perpendicular line at A.

Extra Practice

Worksheet G8

Pages 280-281

For each figure, name all the pairs of parallel and perpendicular segments.

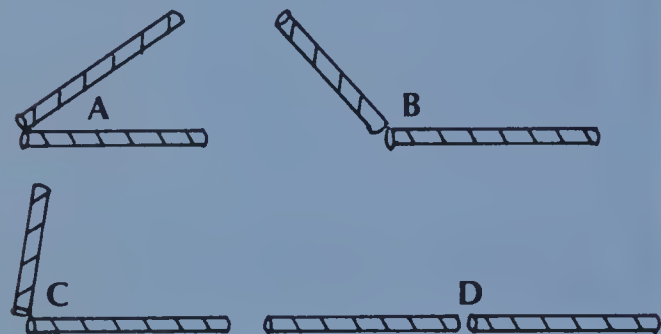


Objective G9

Classify triangles by angles and sides.

Introducing the Lesson

Have students make a variety of angles with straws.

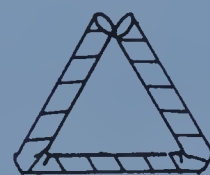
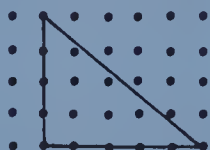
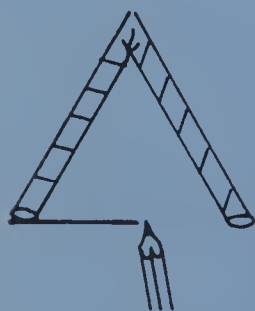
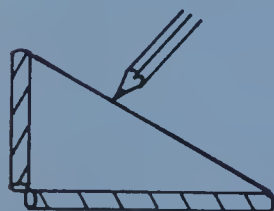


From the last example, have students conclude that this is a **straight angle**, and that it measures 180° (two 90° angles).



Teaching the Lesson

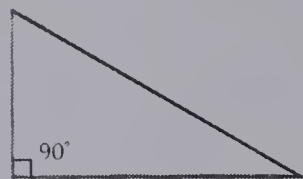
Use straws or geoboards to have students construct right triangles and isosceles triangles. (Note that you can make equilateral triangles with straws but not with a geoboard.)



Give each student an index card. Have them construct two different triangles. Label the corners of each triangle like the example on page 282. Ask the students to tear off the corners of the triangles and arrange them to form a straight line (180°). Conclude that the sum of the angles in a triangle always equals 180° .

Triangles

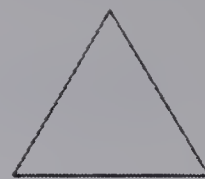
Some triangles have special names.



A **right triangle** has one right angle.

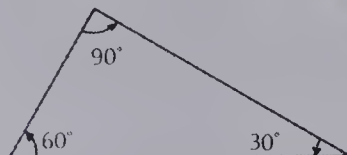
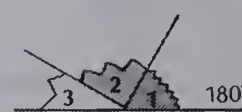
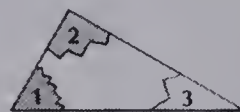


An **isosceles triangle** has 2 congruent sides. It also has two congruent angles.



An **equilateral triangle** has 3 congruent sides. It also has 3 congruent angles.

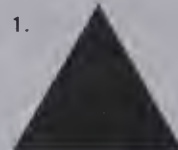
The sum of the angles of any triangle is 180° .



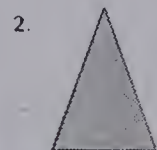
$$60^\circ + 90^\circ + 30^\circ = 180^\circ$$

EXERCISES

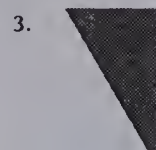
Is the triangle isosceles, right, or equilateral? Use tracing paper to find out.



Equilateral



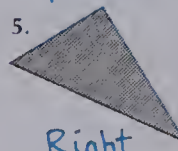
Isosceles



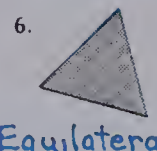
Right



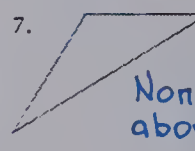
Isosceles



Right



Equilateral



None of above



Right

Using the Exercises


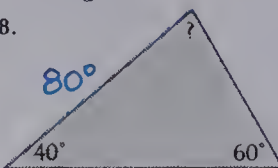
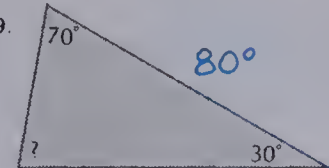
- Questions 1 to 8 require the students to identify isosceles, right, and equilateral triangles.

PRACTICE

What type of triangle is it? Why?

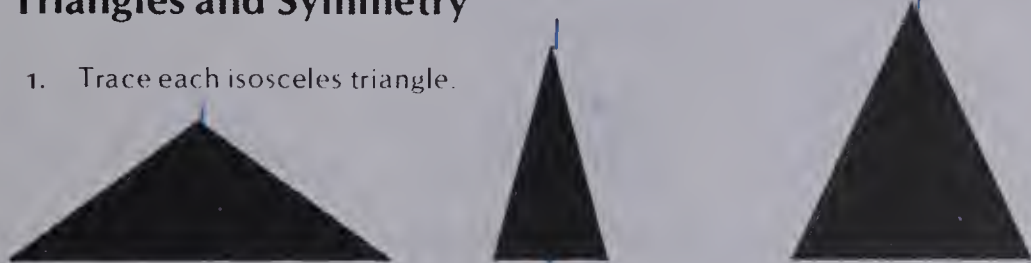
- Sides: 4 cm, 8 cm, and 8 cm. *Isosceles*
- Sides: 8.2 cm, 3.5 cm, and 8.2 cm. *Isosceles*
- Sides: 5.5 cm, 5.5 cm, and 5.5 cm. *Equilateral*
- Each side is 5 m long. *Equilateral*
- Angles: 45°, 45°, and 90°. *Right Isosceles*
- Angles: 35°, 90°, and 55°. *Right*

What is the size of the third angle?

-  25°
-  60°
-  30°
- 20°, 30° *130°*
- 35°, 35° *110°*
- 70°, 80° *30°*
- 29°, 41° *110°*
- 100°, 40° *40°*
- 37°, 58° *85°*
- What is the size of each angle of an equilateral triangle? *60°*
- What is the size of each angle of an isosceles right triangle? *45°, 45°, 90°*

Triangles and Symmetry

- Trace each isosceles triangle.



- Draw a line of symmetry for each isosceles triangle.
- Write a statement about lines of symmetry of isosceles triangles.

- Trace each equilateral triangle.



- Draw the lines of symmetry for each equilateral triangle.
- Write a statement about lines of symmetry of equilateral triangles.

They are perpendicular to the unequal side and through the opposite vertex.

They are through any vertex and perpendicular to the opposite side. All three lines intersect at one point.

283

Extra Practice

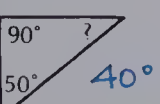
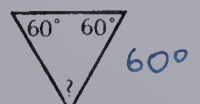
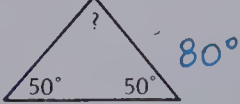
Worksheet G9

Pages 282-283

What type of triangle is it?

- Sides are all equal. *Equilateral*
- Angles are all equal. *Equilateral*
- Two sides are equal. *Isosceles*
- Two angles are equal. *Isosceles*
- Two angles each measure 45°. *Isosceles*

What is the size of the third angle?

-  40°
-  60°
-  80°
- 100°, 50°, *30°*
- 40°, 70°, *70°*
- 45°, 90°, *45°*

Assigning the Practice

Minimum: 1-9

Average: 1-15

Enriched: 1-17

Reinforcement

- Assign *Triangle Symmetry* at the bottom of page 283.

- Ask the students to try to construct:
 - triangle with angles of 60°, 60°, 60°;
 - triangle with angles of 60°, 60°, 90°;
 - triangle with angles of 30°, 20°, 70°;
 - right angle, isosceles, and equilateral triangles.

Triangles for **b.** and **c.** cannot be made.

Enrichment

Remind the students that the sum of the angles in a triangle is 180°.

We can make 2 triangles from a square.



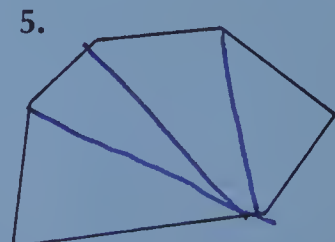
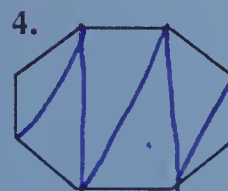
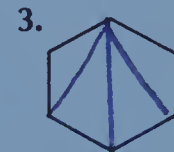
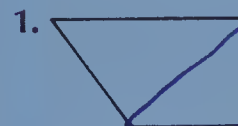
The sum of the angles in a square is $2 \times 180^\circ = 360^\circ$.

We can make 3 triangles from a pentagon.



The sum of the angles in a pentagon is $3 \times 180^\circ = 540^\circ$.

Have the students divide each figure into triangles, count the triangles, then find the sum of the angles in the figure.



UNIT 12 LESSON 10

Objective G10

Classify quadrilaterals.

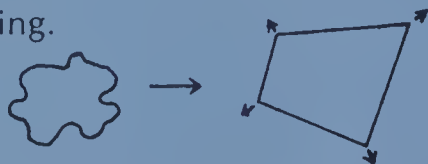
Introducing the Lesson

Provide pairs of students with a metre length of string. Have the students pull on three points of the string.



Have the students make a variety of triangular shapes.

Have students pull on four points of the string.



How many sides does the new figure have? How many vertices?

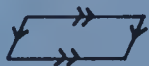
Review that *tri* means 3, so a three-sided figure (with straight sides) is called a *triangle*. A four-sided figure could be called a *quadangle*; however, it is more common to call it a **quadrilateral**. *Quad* means 4.

Teaching the Lesson

Continue the above activity with the string and have students make a variety of quadrilaterals.



Sketch the following on the board and ask students to make the figure with a loop of string.



Point out that the figure with two sets of parallel sides is called a **parallelogram**.



Point out that a figure with four 90° angles is called a **rectangle**. “Is it a parallelogram?” Yes. “Is it a quadrilateral?” Yes.



Point out that the figure with sides of equal length is a **square**. “Is it a rectangle?” Yes. “Is it a parallelogram?” Yes.



Point out that a **rhombus** is a parallelogram with sides of equal length. Discuss the summary on page 284.

Quadrilaterals

Some quadrilaterals have special names

A **parallelogram** is a quadrilateral whose opposite sides are parallel. Its opposite sides are also congruent.

A **rectangle** is a right-angled parallelogram.

A **rhombus** is a parallelogram with four congruent sides.

A **square** is a rectangle with four congruent sides.
A **square** is a right-angled rhombus.

EXERCISES

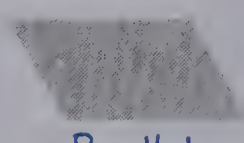
What is a special name for each quadrilateral?

1.



Rectangle

2.



Parallelogram

3.

Rhombus

4.



Square

5.



Parallelogram

6.



Rhombus





Using the Exercises

- Elicit the “best” classification for each quadrilateral. For example, if a student says *rectangle* for question 4, tell them they are correct, but ask for a more “specific” name (square). Why is *square* more “specific”? (Because it is a special rectangle, with equal sides.) Similarly, the rhombuses (questions 3 and 6) are special parallelograms (with equal sides.) The rectangle and square are also special parallelograms (with square corners). Technically, all the quadrilaterals in the exercises are parallelograms. Students with the insight to recognize this should not be discouraged but should learn that the “best” name is the one which gives the most information about the figure.

Problem Solving Activities

Assign Level 6, Unit 12

PRACTICE

1. Draw a parallelogram that isn't a rectangle or rhombus. 
2. Draw a rectangle that isn't a square. 
3. Draw a rhombus that isn't a square. 
4. Draw a square and label it ABCD. 
5. How many lines of symmetry do the figures you drew above have?
1. 0 2. 2 3. 0 4. 4

True or false.

6. A square is a parallelogram. **Yes**
7. A rhombus is a rectangle. **No**
8. A rectangle is a parallelogram. **Yes**
9. A square is a rectangle. **Yes**
10. These quadrilaterals are trapezoids. **4 sides, 1 pair ||**
 - a. Write a statement describing a trapezoid.
 - b. True or false: A trapezoid is a parallelogram. **False**
 - c. True or false: A parallelogram is a trapezoid. **True**

REVIEW




Name the perpendicular and parallel segments.

1.  **AB ⊥ AC**
2.  **DE || GF**
3.  **PQ || SR, PQ ⊥ QR, QR ⊥ SR**

What type of triangle is it? (right, isosceles, equilateral)

4.  **Isosceles**
5.  **Equilateral**
6.  **Right**

What type of quadrilateral is it?

7.  **Rhombus**
8.  **Rectangle**
9.  **Parallelogram**

285

Assigning the Practice

Minimum: 1-5

Average: 1-9

Enriched: 1-10

Review Exercises

Questions	Objective	Pages
1-3	G8	280-281
4-6	G9	282-283
7-9	G10	284-285

Reinforcement

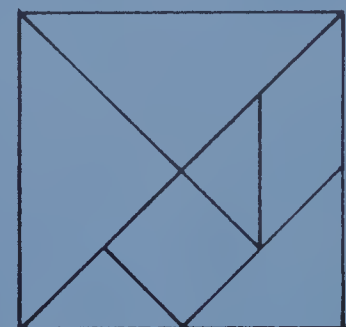
1. Have each student make a paper parallelogram, rhombus, rectangle, and square. Fold them and complete.
 - a. A square has 4 lines of symmetry.
 - b. A rectangle has 2 lines of symmetry.
 - c. A rhombus has 2 lines of symmetry.
 - d. A parallelogram has no lines of symmetry.
2. Have the students draw the diagonals in a parallelogram, rhombus, rectangle, and square.
3. Have the students investigate the **kite** (pairs of adjoining equal sides).



Ask, "How many lines of symmetry? What do we call a kite that has all sides equal? *Rhombus or square.*"

Enrichment

Have the students make a tangram by cutting a square as shown.



1. Name the 7 figures.
2. How many are quadrilaterals?
3. Use combinations of the figures to make quadrilaterals. Who can make the most quadrilaterals?
4. Make a rhombus, square, trapezoid, etc.

Extra Practice

Worksheet G10

Pages 284-285

Who am I?

1. I have two pairs of parallel sides. Parallelogram or rhombus
2. I am a rectangle with all sides congruent. Square
3. I am a rhombus with 90° angles. Square
4. I am a parallelogram with all sides congruent. Square or rhombus
5. I am a parallelogram with 90° angles. Rectangle
6. I am a quadrilateral with exactly two lines of symmetry. Rectangle
7. I am a quadrilateral with four lines of symmetry. Square
8. I have two pairs of equal sides and no lines of symmetry. Parallelogram

Unit 12 Objective	Test Questions	Pages
G1	6	266-267
G2	1-4	268-269
G3	8	270-271
G4	10	272-273
G5	5, 7, 9	274-275
G6	11-13	276-277
G7	14-15	278-279
G8	16-17	280-281
G9	18-20	282-283
G10	21-23	284-285

TEST

UNIT 12

How many lines of symmetry does each figure have?

1.



4



3.



4.



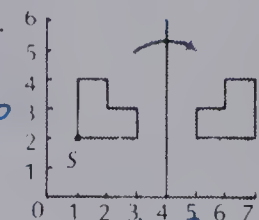
Write slide, flip, or turn.

5.



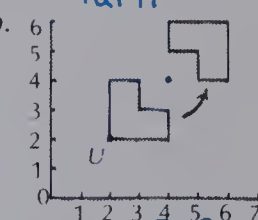
Slide

7.



Flip

9.



Turn

6. R is at (■, ■).

The image of R is at (■, ■).

8. S is at (■, ■).

The image of S is at (■, ■).

10. U is at (■, ■).

The image of U is at (■, ■).

Are the figures congruent or not congruent? Use tracings.

11.



Yes

12.



Yes

13.



No

The figures on the right are congruent. Complete the statements.

14. Angle D is congruent to ■.

U

15. Side BC is congruent to ■.

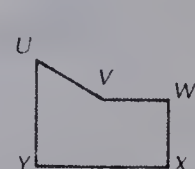
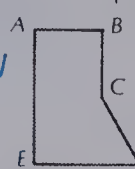
VW

16. Sides AE and ED are ■.

⊥

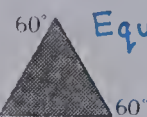
17. Sides AE and BC are ■.

||



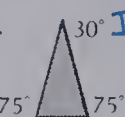
Name the triangle (isosceles, equilateral, right)

18.



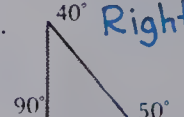
Equilateral

19.



Isosceles

20.



Right

21. A quadrilateral with two pairs of parallel sides is called a ■.

Parallelogram

22. A rhombus with angles of 90° is called a ■.

Square

23. A parallelogram with angles of 90° is called a ■.

Rectangle

Post-test

Unit 12

Draw a line of symmetry for each figure.

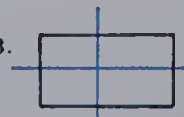
1.



2.



3.



4.



Draw the image.

Name its coordinates.

5. Slide A right 3, down 2.

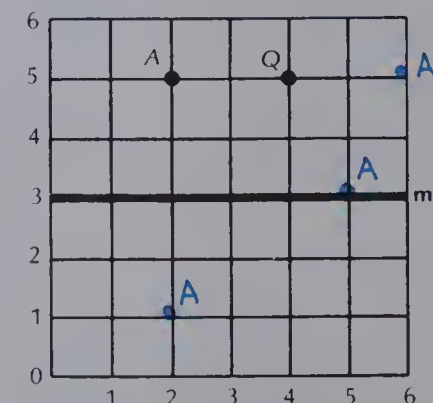
6. Image: (5, 3)

7. Flip A over line m

8. Image of A (2, 1)

9. Turn A about Q ($\frac{1}{2}$ turn).

10. Image of A (6, 5)



COMPUTATION

Calculate

1.
$$\begin{array}{r} 423 \\ + 964 \\ \hline 1387 \end{array}$$

2.
$$\begin{array}{r} 27 \\ 9 \\ + 365 \\ \hline 401 \end{array}$$

3.
$$\begin{array}{r} 6.8 \\ 47.6 \\ + 97.3 \\ \hline 151.7 \end{array}$$

4.
$$\begin{array}{r} 8.76 \\ 9.4 \\ + 67.85 \\ \hline 86.01 \end{array}$$

5.
$$\begin{array}{r} 9002 \\ - 2765 \\ \hline 6237 \end{array}$$

6.
$$\begin{array}{r} 2408 \\ - 693 \\ \hline 1715 \end{array}$$

7.
$$\begin{array}{r} 50.0 \\ - 37.16 \\ \hline 12.84 \end{array}$$

8.
$$\begin{array}{r} 36.2 \\ - 3.45 \\ \hline 32.75 \end{array}$$

9.
$$\begin{array}{r} 17 \\ \times 56 \\ \hline 952 \end{array}$$

10.
$$\begin{array}{r} 63 \\ \times 25 \\ \hline 1575 \end{array}$$

11.
$$\begin{array}{r} 947 \\ \times 659 \\ \hline 624073 \end{array}$$

12.
$$\begin{array}{r} 2473 \\ \times 7000 \\ \hline 17311000 \end{array}$$

13.
$$\begin{array}{r} 972 \\ \times 0.3 \\ \hline 291.6 \end{array}$$

14.
$$\begin{array}{r} 34.6 \\ \times 1.2 \\ \hline 41.52 \end{array}$$

15.
$$\begin{array}{r} 6.8 \\ \times 4.7 \\ \hline 31.96 \end{array}$$

16.
$$\begin{array}{r} 473.1 \\ \times 0.01 \\ \hline 4.731 \end{array}$$

17.
$$\begin{array}{r} 58 \\ 9 \overline{)522} \end{array}$$

18.
$$\begin{array}{r} 408 \\ 8 \overline{)3264} \end{array}$$

19.
$$\begin{array}{r} 16 \text{ R}1 \\ 26 \overline{)417} \end{array}$$

20.
$$\begin{array}{r} 40 \\ 75 \overline{)3000} \end{array}$$

21.
$$\begin{array}{r} 3.825 \\ 4 \overline{)15.3} \end{array}$$

22.
$$\begin{array}{r} 123 \\ 0.2 \overline{)24.6} \end{array}$$

23.
$$\begin{array}{r} 318 \\ 0.3 \overline{)95.4} \end{array}$$

24.
$$\begin{array}{r} 7 \\ 0.1 \overline{)0.7} \end{array}$$

25.

N	$83.4 + N$
96	179.4
0.8	84.2
2.19	85.59
7	90.4
0.27	83.67

26.

N	$N \div 86$
258	3
86	1
1462	17
455.8	5.3
860	10

27.

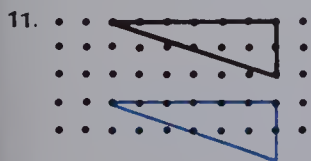
N	$0.4 \times (N - 1.5)$
1.5	0
3	0.6
2	0.2
11.5	4
37.5	14.4

Solve.

28. The Sobels planned on travelling 415 km in the first day of their holiday. In the first two hours, they went 166 km. At that rate, how long did they travel the first day? 5h

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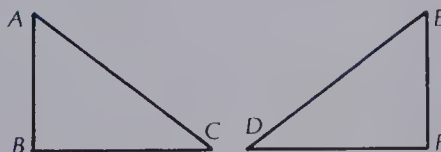
Draw a congruent triangle.



These triangles are congruent.

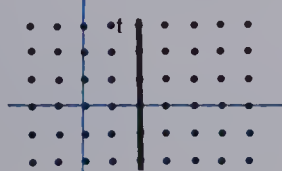
14. Side AB corresponds to side EF.

15. Vertex C corresponds to vertex D.



16. Draw a line parallel to t.

17. Draw a line perpendicular to t.



18. Two angles in a triangle measure 90° and 60° . The third angle is 30°

Draw and label each.

19. isosceles triangle

20. rectangle

21. parallelogram

22. right triangle

23. square

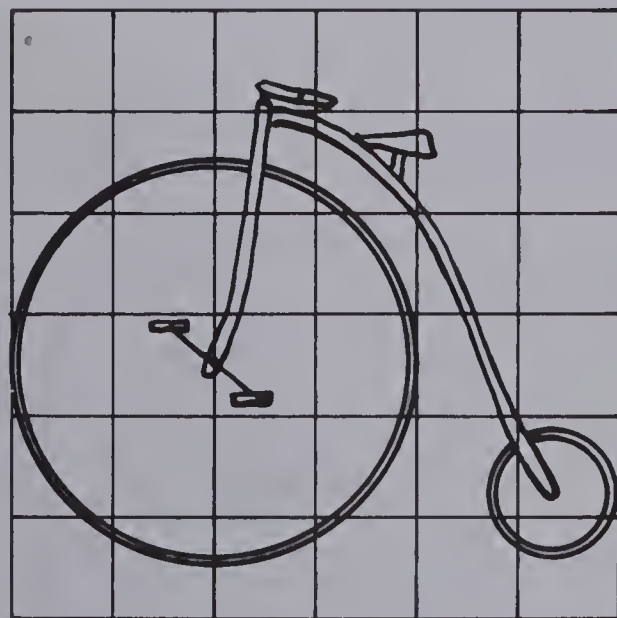
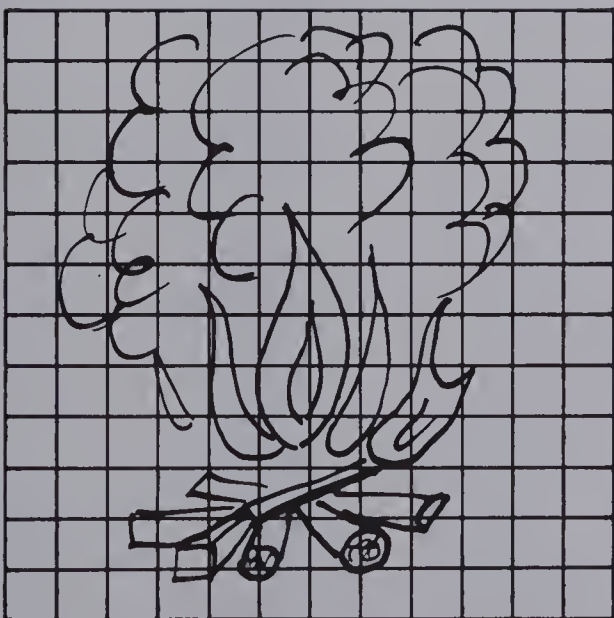
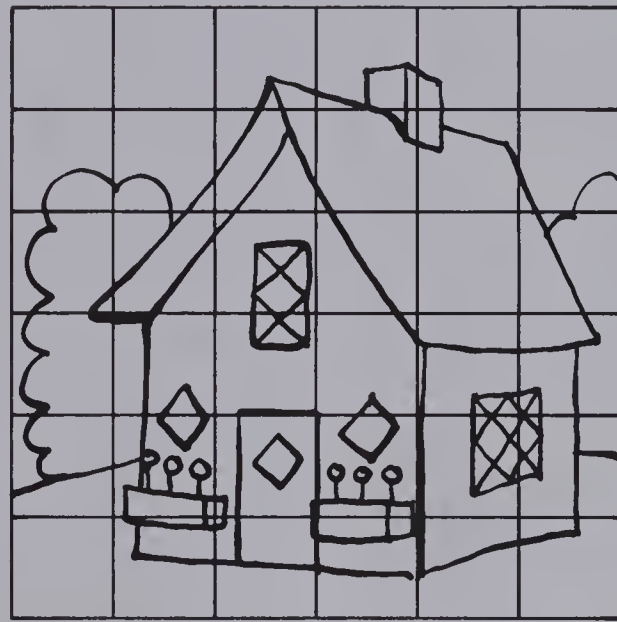
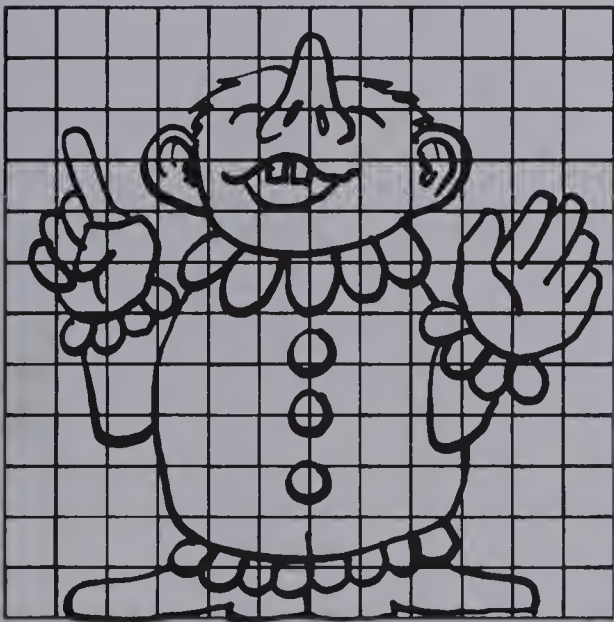
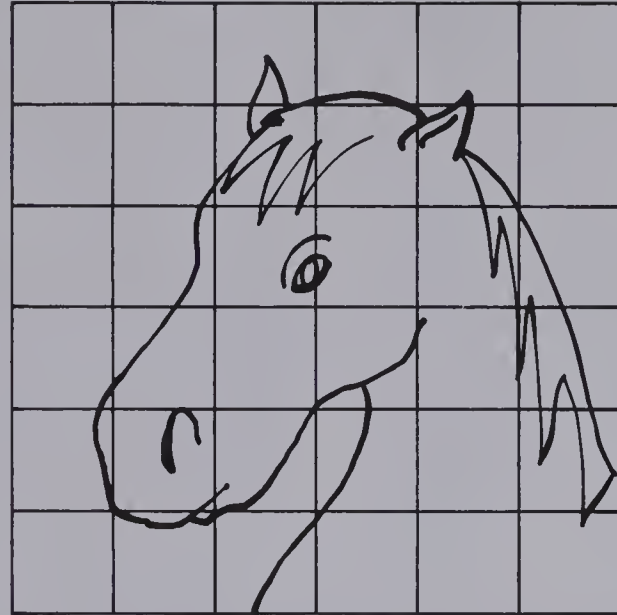
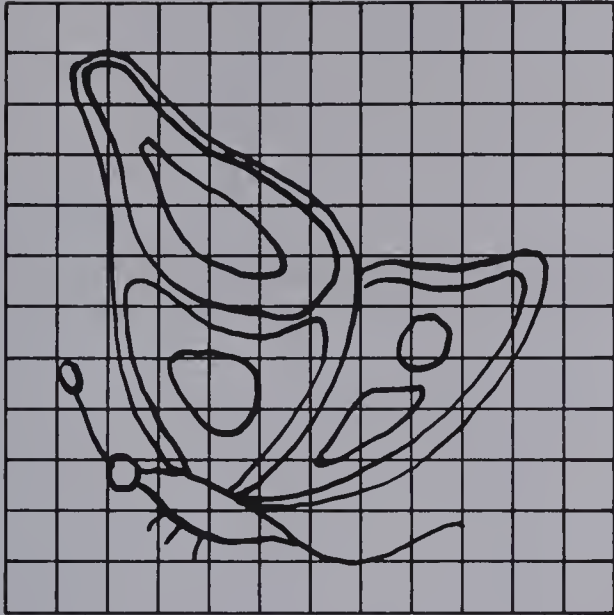
UNIT 13

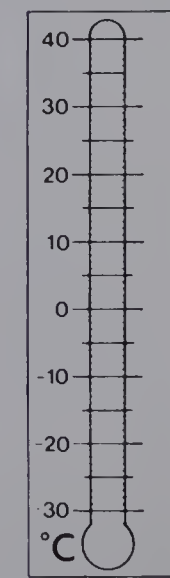
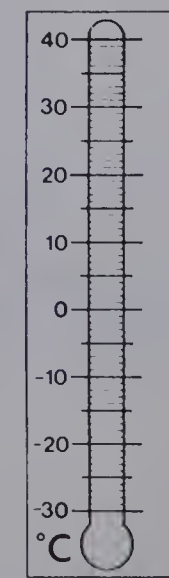
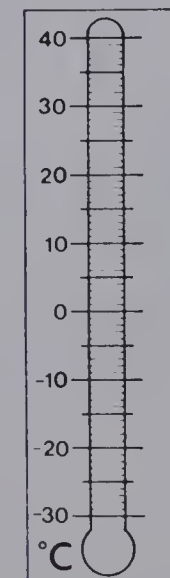
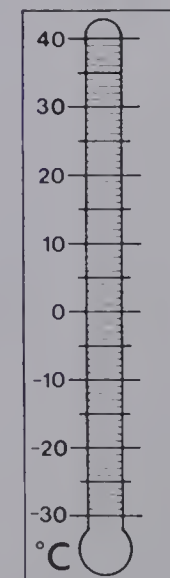
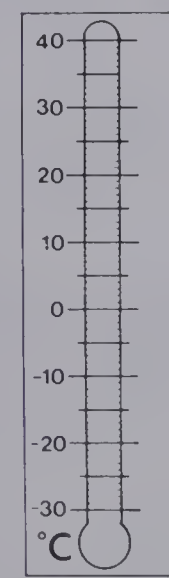
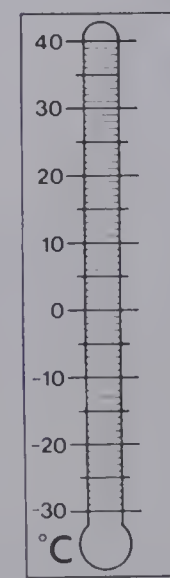
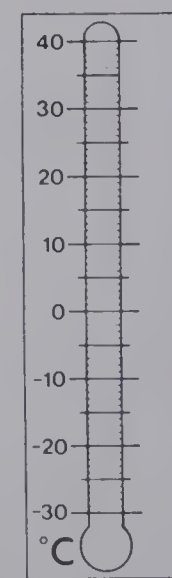
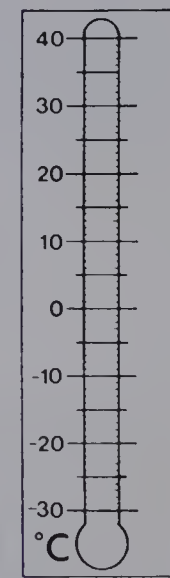
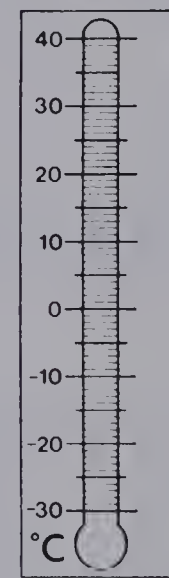
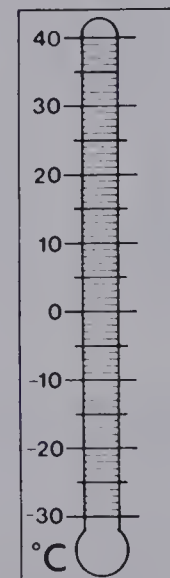
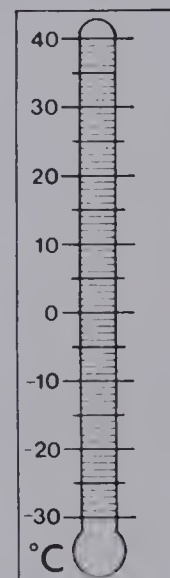
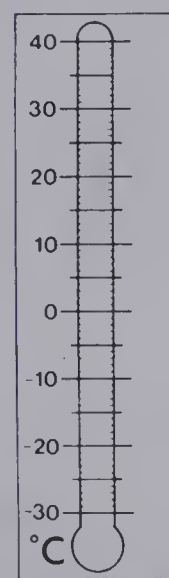
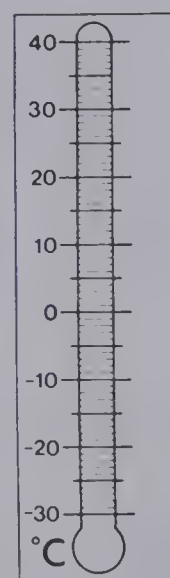
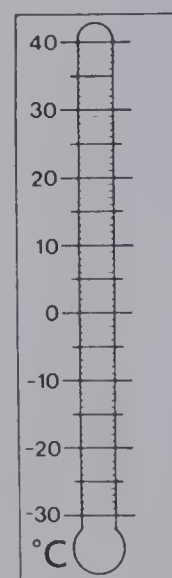
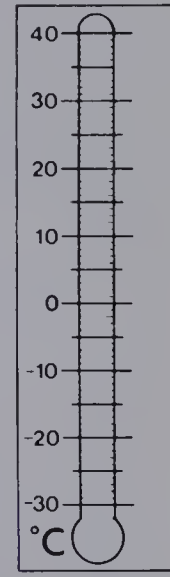
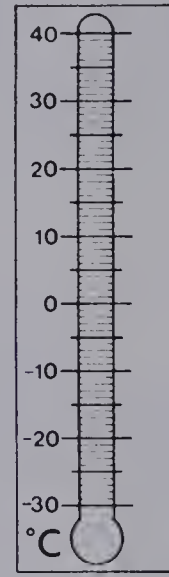
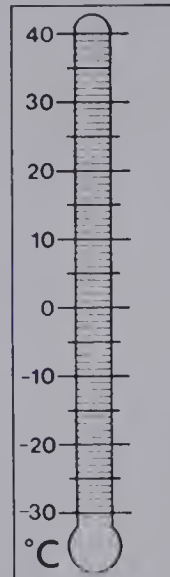
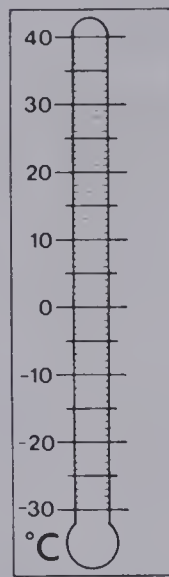
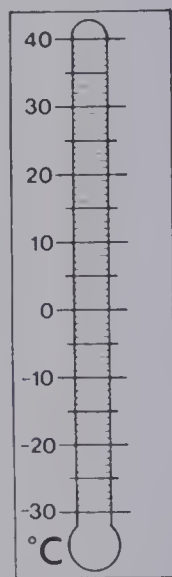
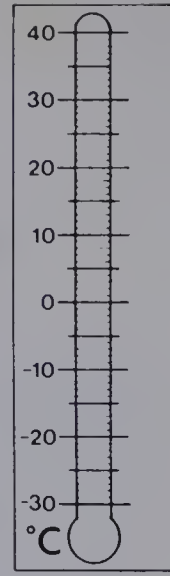
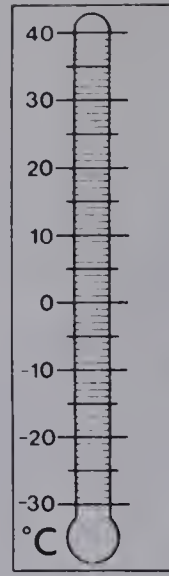
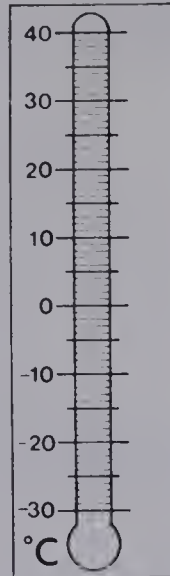
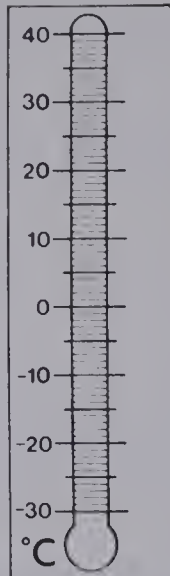
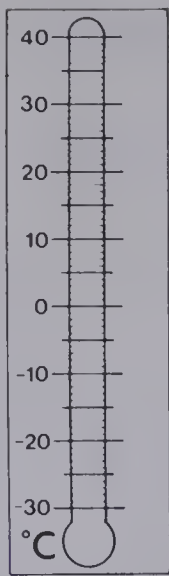
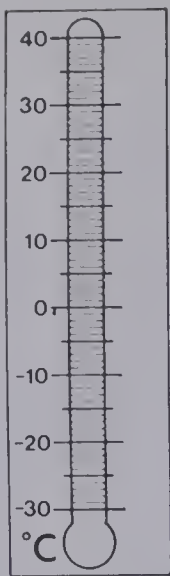
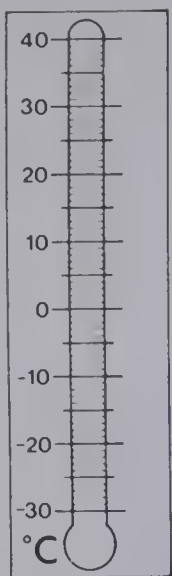
Graphs and Applications

Theme: World Geography

Lesson		Objective	Pages
Preview		Review the use of coordinates for locating points on a grid.	289
1	GR5	Generate and graph ordered pairs from a given rule.	290-291
2	M16	Read and interpret temperatures above and below 0°C.	292-293
3	N21	Understand positive and negative numbers.	294-295
4	N22	Order positive and negative numbers.	296-297
5	GR6	Locate and plot points on the full coordinate plane.	298-299
6	PS13	Use patterns to solve problems.	300-301
7	G11	Identify tessellations and figures that can be used to make tessellations.	302-303
8	G12	Recognize similar figures and the corresponding parts of similar figures.	304-305
9	G13	Read scale drawings and calculate distances from scales.	306-307
10	PS14	Solve two-step and three-step problems.	308-309
Test		Graphs and applications	310
Review		Geometry	311

Pictures to Enlarge





About This Unit

The ten lessons of Unit 13 provide a variety of mathematical activities that not only extend concepts learned earlier to new levels, but also introduce new topics that will be developed further in succeeding years.

Plotting ordered pairs and locating points on a graph was begun at Grade 3 of the *Houghton Mifflin Mathematics Program*. Here in Grade 6, the students continue this study and are introduced to the locating of points using all four quadrants of the full coordinate plane. The study of temperatures above and below 0°C leads the students to an understanding of both positive and negative integers. After learning how to order integers, students will have been adequately prepared for the graphing activities in four quadrants presented in Lesson 5 of this unit.

Previously learned geometric concepts are also expanded upon in this unit. In Unit 12, students became familiar with the naming of polygons, angles, and line segments. The term “congruence” was also studied. In Unit 13, students become familiar with similar figures (in contrast to congruent figures). Corresponding angles and sides of similar figures also are discussed.

All of the lessons of this unit have practical applications. Lessons 1 and 6, for example, show how the use of patterns can assist in making predictions and solving real-life problems. The study of scale drawings in Lesson 9 is useful in map reading and in enlarging pictures. Lesson 10 offers many practical suggestions for helping students solve practical problems involving two and three computational steps.

Unit 13 incorporates many mathematical areas and thus it both pulls together and extends many arithmetic, numeration, measurement, graphing, geometry, and problem-solving skills learned in the first twelve units.

Ideas

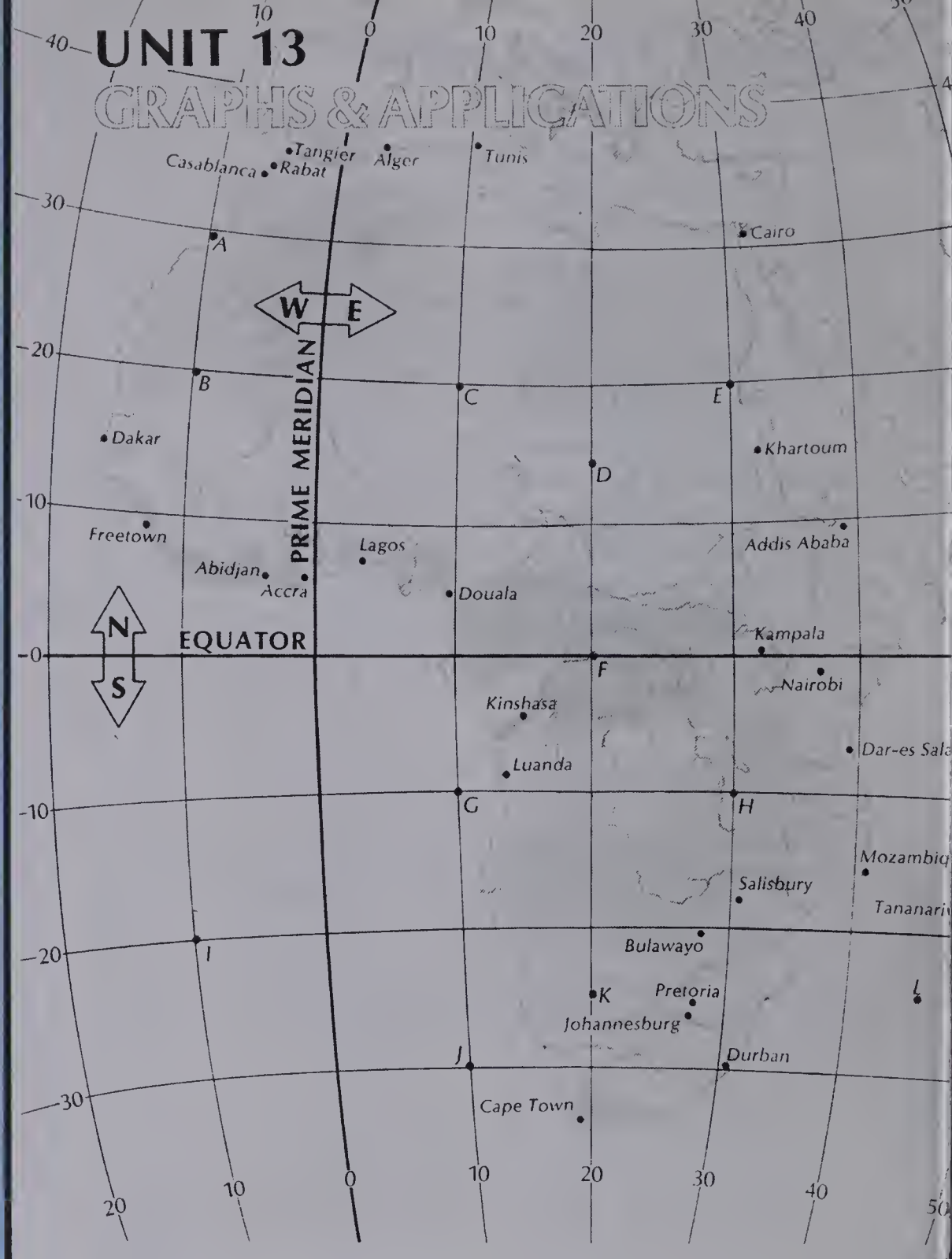
An ordinary newspaper can provide many activities related to topics in this unit.

- graphing the temperatures across Canada using the daily temperature report
- graphing the ups and downs of a few stocks
- determining map distances from maps printed in news stories
- writing two- and three-step problems using car, home, and grocery store ads
- folding and cutting the newspaper into various shapes from which an enlarged, similar shape can be created
- determining whether shapes cut from the newspaper will tessellate
- enlarging cartoon figures or maps



UNIT 13

GRAPHS & APPLICATIONS



Unit 13 Objective	Test Questions	Pages
GR5	1-2	290-291
M16	3-5	292-293
N21	6-7	294-295
N22	8-10	296-297
GR6	11-14	298-299
G11	15	302-303
G12	16-17	304-305
G13	18-19	306-307

Pretest

Unit 13

Complete the pattern. State the rule.

- (0, 0) (1, 7) (2, 14) (3, 21) (4, 28) (5, 35)
- (1, 19) (2, 20) (3, 21) (4, 22) (5, 23) (6, 24)

Which temperature is lower?

- 9°C or -3°C
- 0°C or -4°C
- +8°C or +12°C

Complete the pattern.

- 8, -6, -4, -2, 0, +2
- +12, +9, +6, +3, 0, -3

Complete using < or >

- +8 > +4
- 2 < -1
- 0 > -5

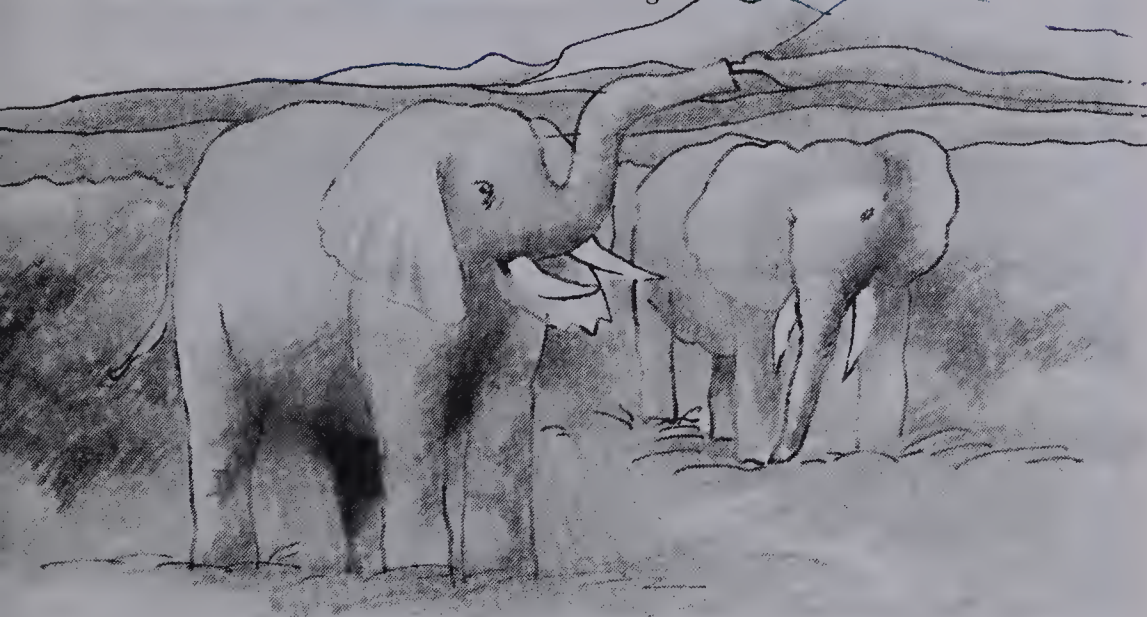
African Safari

What letter appears at each location?

- | | | | |
|--------------|----------|----------|---------------|
| 1. 20°N 10°E | C | B | 2. 20°N 10°W |
| 3. 0° 20°E | F | G | 4. 10°S 10°E |
| 5. 10°S 30°E | H | I | 6. 20°S 10°W |
| 7. 30°S 10°E | J | D | 8. 15°N 20°E |
| 9. 25°S 20°E | K | L | 10. 25°S 45°E |

Give the approximate location.

- | | | | |
|--------------|------------------|----------------|------------------|
| 11. Cairo | 30°N 30°E | 12. Accra | 5°N 0° |
| 13. Kampala | 0° 30°E | 14. Tunis | 35°N 10°E |
| 15. Durban | 30°S 30°E | 16. Mozambique | 15°S 40°E |
| 17. Douala | 5°N 10°E | 18. Bulawayo | 20°S 30°E |
| 19. Kinshasa | 5°S 15°E | 20. Khartoum | 15°N 30°E |
| 21. Dakar | 15°N 15°W | 22. Abidjan | 5°N 5°W |
| 23. Nairobi | 0° 35°E | 24. Tangier | 35°N 5°W |



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UNIT 13

PREVIEW

Suggestions

Have the students study the map of Africa on page 288. Note the bodies of water which surround Africa. Point out the desert and forest areas of the continent. Ask, "What would temperatures likely be in Africa? Why?" Compare Africa to North America with the following facts about the two continents.

	Africa	North America
Size of continent	2nd largest 30 244 000 km ²	3rd largest 24 346 000 km ²
Highest point	Mt. Kibo 5899 m	Mt. McKinley 6194 m
Lowest point	Qattarah Depression, Egypt 133 m below sea level	Death Valley, Calif. 86 m below sea level

About the Page

Point out the equator. Explain how the latitudinal lines are numbered from above and below it. Ask the students to tell which latitudinal lines the cities of Cairo, Durbin, Tananarive, and Free-town are closest to. Be sure that the students also say whether they are located north or south of the equator.

Point out the prime meridian. Explain how the longitudinal lines are numbered on either side of it. Ask, "What city lies near 20°E? between 10°W and 20°W?"

Place a map of Africa on the overhead projector. Give the students practice in locating several points on the latitudinal and longitudinal grid. Point out that a location is described by **coordinates** or an **ordered pair**. The first number in the pair refers to the latitude of the location. It tells you how far the location is north or south of the equator. The second number in the pair refers to the longitude of the location. It tells you how far the location is east or west of the prime meridian.

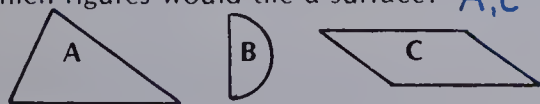
Name the point located by the ordered pair.

11. $(-2, +2)$ **N** 12. $(+2, -1)$ **P**

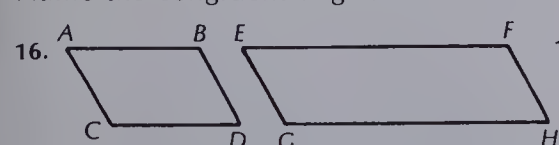
Write the ordered pair for each.

13. M **$(0, +2)$** 14. Q **$(-3, +2)$**

15. Which figures would tile a surface? **A, C**

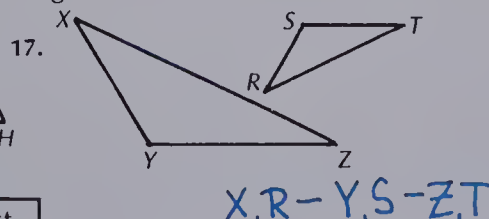
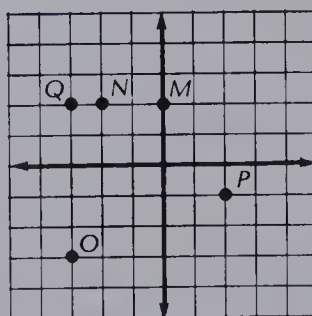


Name the congruent angles in the similar figures.



Complete. **A, E - B, F - C, G - D, H**

	Scale	Drawing	Real Object
18.	1:200	8 cm	16 m
19.	1:25	7 cm	1.75 m



X, R - Y, S - Z, T

Objective GR5

Generate and graph ordered pairs from a given rule.

Introducing the Lesson

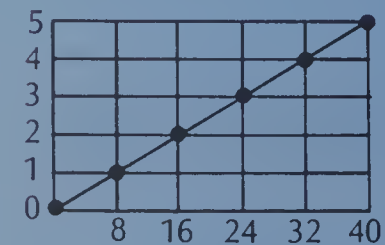
Discuss relationships between pairs of numbers that students encounter in daily life, e.g., 1 package of gum has 7 sticks of gum, 2 packages of gum have 14 sticks of gum; 1 bus carries 50 students, 2 buses carry 100 students; 1 cup of milk and 2 spoons of chocolate, 2 cups of milk and 4 spoons of chocolate; and so on. Point out that the continuation of these patterns can be anticipated because the pattern rule is regular. Show these relationships on charts. Have the students decide on the pattern rules and then predict the continuations of the patterns.

Rule: $\times 7$		Rule: $\times 50$		Rule: $\times 2$	
1	7	1	50	1	2
2	14	2	100	2	4
3		3		3	
4		4		4	

Teaching the Lesson

Point out the relationship between the pairs of numbers in the chart and graph at the top of page 290. Explain how each pair of numbers can be written as an **ordered pair** and then graphed. The first number of the ordered pair is located using the horizontal axis and the second number is located using the vertical axis. Note the straight line that is formed when the points on the graph are connected.

Show the following graph. Ask the students to use the graph to continue the pattern shown in the chart.



Rule: ?	
0	0
8	1
16	2
?	?
?	?

Ask, "What is the rule that describes this pattern? Predict the next ordered pair to be graphed after (32, 4)."

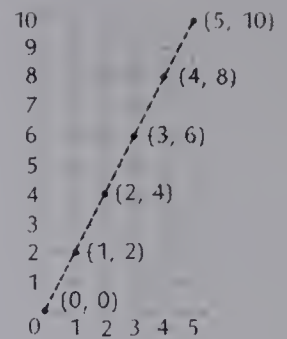
Predictable Pairs

Rule: $\times 2$

0	0
1	2
2	4
3	6
4	8
5	10

Ordered pairs

(0, 0)
(1, 2)
(2, 4)
(3, 6)
(4, 8)
(5, 10)

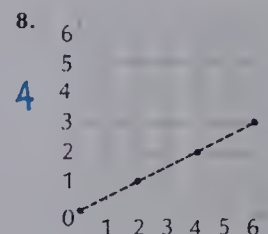
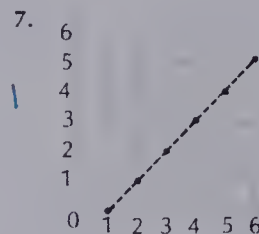
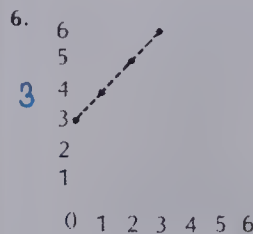


EXERCISES

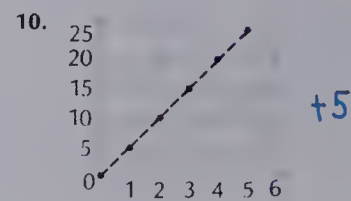
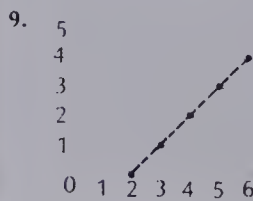
Copy and complete the pattern. State the rule.

- (1, 0) (2, 1) (3, 2) (4, 3) (5, \blacksquare) (6, \blacksquare) (7, \blacksquare)
- (0, 0) (1, 1) (2, 2) (3, 3) (4, 4) (5, \blacksquare) (6, \blacksquare) (7, \blacksquare)
- (0, 3) (1, 4) (2, 5) (3, 6) (4, \blacksquare) (\blacksquare , \blacksquare) (\blacksquare , \blacksquare)
- (0, 0) (2, 1) (4, 2) (6, 3) (8, 4) (10, \blacksquare) (\blacksquare , \blacksquare) (\blacksquare , \blacksquare)
- (0, 5) (1, 6) (2, 7) (3, 8) (4, 9) (\blacksquare , \blacksquare) (\blacksquare , \blacksquare) (\blacksquare , \blacksquare)

Match each graph to a set of ordered pairs above.



State the rule for the ordered pairs.



Using the Exercises

- Questions 1 to 5 require the students to study the sets of ordered pairs, determine the pattern rule, and then use the rule to continue the pattern.
- Questions 6 to 8 involve matching graphs to sets of ordered pairs. Some students may need to write the ordered pairs that are graphed in order to do this.
- Questions 9 and 10 require the students to list the ordered pairs that are graphed and then determine the pattern rule.

PRACTICE

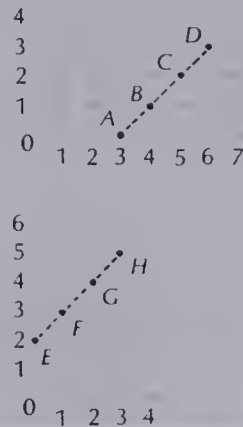
Copy and complete the pattern. State the rule.

- (1, 2) (2, 3) (3, 4) ... (8, 9)
- (1, 3) (2, 6) (3, 9) ... (8, 24)
- (3, 1) (6, 2) (9, 3) ... (24, 8)
- (4, 0) (5, 1) (6, 2) ... (11, 7)

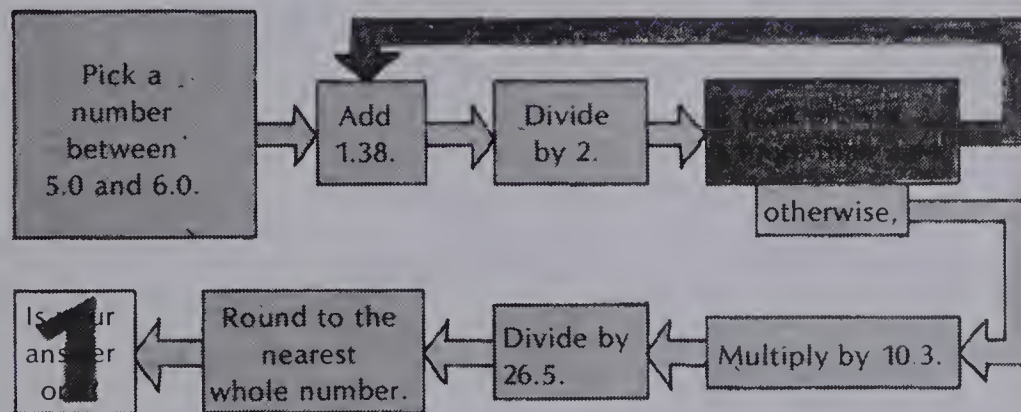
$+1$
 $\times 3$
 $\div 3$
 -4

Use the graph on the right.

- Write the ordered pairs for A, B, C, and D.
A(3,0) B(4,1) C(5,2) D(6,3)
- State the rule for the pattern.
 -3
- Write the ordered pairs for E, F, G, and H.
E(0,2) F(1,3) G(2,4) H(3,5)
- State the rule for the pattern.
 $+2$
- Graph the ordered pairs in question 1.
- Graph the ordered pairs in question 2.



Calculator Maze



291

Assigning the Practice

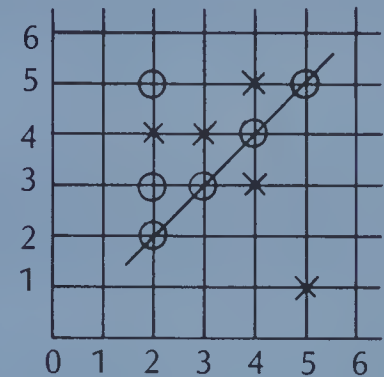
Minimum: 1-9

Average: 1-10

Enriched: 1-10

Reinforcement

1. Give pairs of students two dice and grid paper marked as shown below. Play "Tick-Tack-Toe, Four in a Row". Each player takes turns rolling the dice, making an ordered pair from the numbers rolled, and marking the pair on the grid with an X or an O. The winner is the player with four Xs or four Os in a row.



2. Have the students name the missing numbers in each chart.

a. Rule: $-2, \times 3$

2	
3	
4	

b. Rule: $+2, \div 2$

0	
2	
4	

c. Rule: $\times 3, -1$

1	
2	
3	

d. Rule: $\div 6, +6$

6	
12	
18	

3. Ask the students to graph the above charts. Some students may also be interested in predicting the next several ordered pairs that continue the patterns.

Enrichment

1. Assign *Calculator Maze* at the bottom of page 291.

2. Have the students continue these patterns as they complete the charts and graph the ordered pairs. See how far they can continue the patterns.

a. In Out

N	$60 \div (N + 3)$
0	
1	
2	

b. In Out

N	$N \times 4 \div 2$
0	
1	
2	

Extra Practice

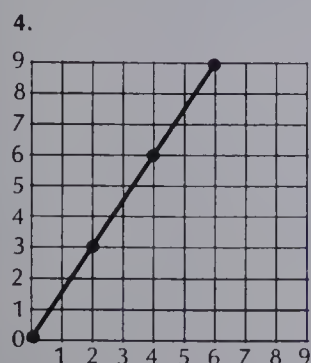
Worksheet GR5

Pages 290-291

Complete the pattern.

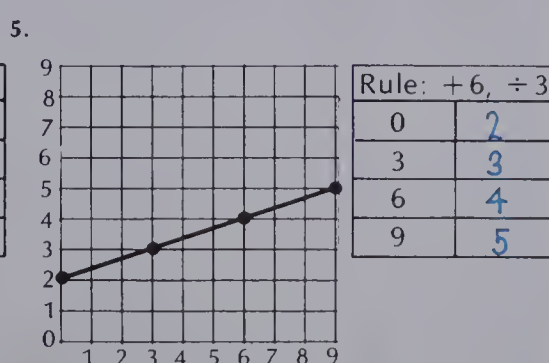
- (2, 7) (3, 8) (4, 9) (5, 10) (6, 11) (7, 12)
- (84, 7) (72, 6) (60, 5) (48, 4) (36, 3) (24, 2)
- (20, 17.5) (16, 13.5) (12, 9.5) (8, 5.5) (4, 1.5)

Use the graph to complete the chart.



Rule: $\times 3, \div 2$

0	<u>0</u>
2	<u>3</u>
4	<u>6</u>
6	<u>9</u>



Rule: $+6, \div 3$

0	<u>2</u>
3	<u>3</u>
6	<u>4</u>
9	<u>5</u>

Objective M16

Read and interpret temperatures above and below 0°C .

Introducing the Lesson

Display cups of ice water, cool water, room-temperature water, warm water, and boiling water. Place a thermometer in each. Ask a student to read the temperatures. Record each on the chalkboard with the reminder that temperature is measured in degrees Celsius. Discuss the freezing point of water (0°C) and the boiling point of water (100°C).

Ask the students to name a typical temperature for each season in your area and then record it. Ask, "Does the temperature ever go below 0°C ?" Point out that temperatures in the Canadian Arctic are most often below zero.

Teaching the Lesson

Read and discuss the information at the top of page 292. (Note that in everyday language -10°C is often read as "minus 10°C " even though it would mathematically be more correct to say "negative 10°C ".) Ask the students to approximate the temperatures in degrees Celsius they would think best for bathwater, hot chocolate, lemonade, the watering of plants, the baking of a cake, and for broiling a steak. Ask, "What sports depend on temperatures being below 0°C ?"

Give each student a worksheet of blank thermometers (provided with this *Teacher's Resource Book*). Point out 0°C . Ask them to label the temperatures above zero, counting by tens. Show them how to record the numbers below zero, counting back by tens from 0°C . Discuss also the markings between the multiples of ten which enable one to read temperatures to the nearest degree. Point out, too, that the temperatures below zero often are recorded with a minus (or negative) sign. Have the students locate and label on their paper thermometers some of the temperatures discussed earlier.

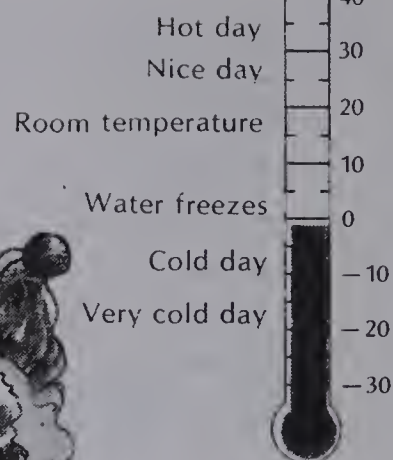
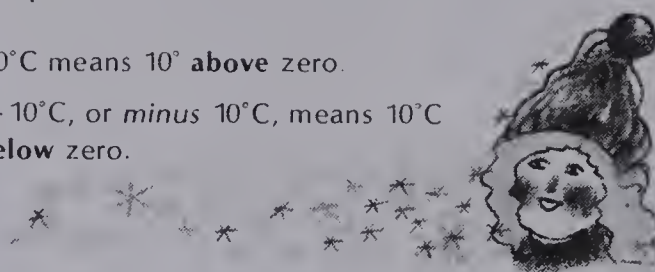
Temperature

Temperatures *below* zero are marked on a thermometer in the **opposite direction** to temperatures *above* zero.

The colder it gets, the lower the temperature.

10°C means 10° **above** zero.

-10°C , or *minus* 10°C , means 10°C **below** zero.



EXERCISES

Use the thermometer on the right. What is the temperature at each point?

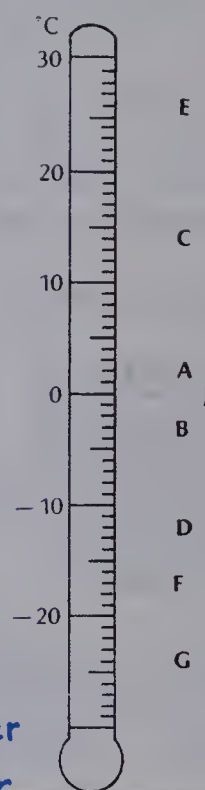
1. A 2°C 2. B -3°C 3. C 14°C 4. D -12°C
5. E 26°C 6. F -17°C 7. G -24°C 8. J 0°C

Which temperature is higher?

9. 10°C or -10°C 10. -5°C or -15°C
11. 8°C or 32°C 12. -20°C or 4°C
13. 12°C or -14°C 14. -18°C or -11°C
15. 0°C or -5°C 16. 3°C or 0°C

Copy and complete using "is higher than" or "is lower than".

17. 2°C \bullet 18°C **lower** 18. 3°C \bullet -6°C **higher**
19. -12°C \bullet -15°C 20. -8°C \bullet 4°C **lower**
21. 32°C \bullet 9°C **higher** 22. -16°C \bullet -11°C **lower**
23. 19°C \bullet -27°C **higher** 24. 4°C \bullet 8°C **lower**



292

Using the Exercises

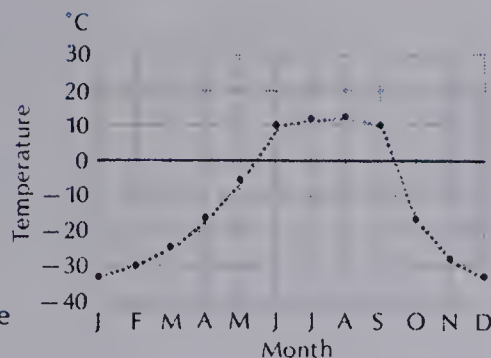
- Questions 1 to 8 require the students to identify thermometer readings. See that the temperatures below zero are recorded properly with a minus sign.
- Questions 9 to 16 involve reading the higher of two temperatures. Some students may need to refer to the thermometer shown on the page to answer these correctly.
- Questions 17 to 24 require the students to compare two temperatures.

PRACTICE

Copy and complete using "is higher than" or "is lower than"

- 12°C ● -12°C Higher
- 11°C ● 15°C Lower
- 5°C ● -25°C Higher
- -8°C ● 8°C Lower
- -7°C ● -4°C Lower
- -13°C ● -16°C Higher

The graph shows the average monthly temperatures at Eureka in the Canadian Arctic.

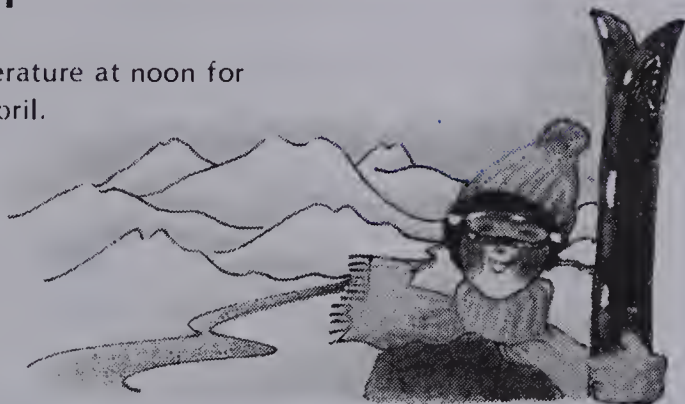


- What is the warmest month? August
- What months are coldest? January, December
- Which month is colder, November or February? February
- What is the average temperature during June? 10°C
- What is the average temperature during May? -5°C
- How much warmer is June than May? 15°
- How much colder is February than August? 42°C

Double Line Graph

The chart shows the temperature at noon for one week in March and April.

	March	April
Sunday	-5°C	6°C
Monday	-3°C	4°C
Tuesday	-4°C	0°C
Wednesday	-1°C	-2°C
Thursday	3°C	-1°C
Friday	5°C	0°C
Saturday	4°C	0°C



Make a line graph to show this information.

293

Assigning the Practice

Minimum: 1-10

Average: 4-13

Enriched: 4-13

Reinforcement

1. Give the students a worksheet of blank thermometers (provided with this *Teacher's Resource Book*) to label in degrees Celsius. Then display the current temperatures in various cities all over the world and ask them to mark these temperatures on their paper thermometers.

2. Which statements are reasonable? For those which are not, change the temperature to make the statement reasonable.

- The temperature in the Sahara Desert was 51°C .
- Bill had a fever of 98°C .
- The temperature at the top of Mt. Everest was -20°C .
- The temperature of ice cream is 16°C .
- The temperature of the swimming pool water was 7°C .
- Good skiing weather is -3°C .
- The potatoes baked in the oven for over an hour at 177°C .

Enrichment

- Assign *Double Line Graph* at the bottom of page 293.
- Have the students research the locations where the highest and lowest temperatures on earth have been recorded. Compare these to the highest and lowest temperatures recorded in your city, area, province, or country.
- Write problems similar to the following on cards for the students to solve.

Where am I?

From where I am standing, I can see heavy jungle growth. Out past the jungle, I see hot bush and grasslands. Grazing in the grasslands are elephants, giraffes, and gazelles. Under a shady tree lies a sleepy lion trying to stay cool away from the hot sun. I turn my head and see only a few kilometres away the wind blowing snow across a large, snowy ice-field.

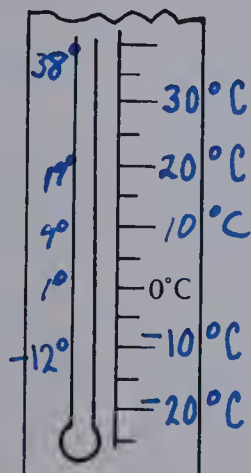
Answer: Mt. Kilimanjaro, Africa

Extra Practice

Worksheet M16

Pages 292-293

- Write 30°C , 20°C , 10°C , -10°C , and -20°C on the thermometer.



- Write the letter to match the temperature.

- | | |
|----------------------------|--------------------------|
| 19° warm day | a. -12°C |
| 82° hot chocolate | b. 9°C |
| 1° ice water | c. 38°C |
| -12° freezer | d. 82°C |
| 9° cool day | e. 19°C |
| 38° fever | f. 1°C |

- Write each temperature above on the thermometer.

Objective N21

Understand positive and negative numbers.

Introducing the Lesson

Point out the similarities in the thermometer scale and the vertical number line at the top of page 294. Explain that all numbers above zero are **positive** and those below zero are **negative** on each. Note the arrows at the ends of the line which indicate that the number line continues infinitely in both directions.

Show the same features on the horizontal number line. Explain how zero separates the numbers on the left (negative) from those on the right (positive).

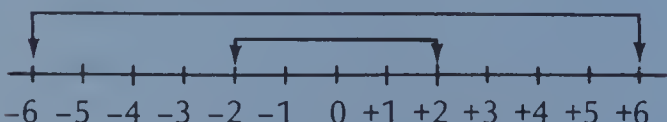
Teaching the Lesson

Give each student a blank vertical number line. Have them locate a central point and label it "0". Then have them fill in the positive and negative numbers. Arrows can be put on the ends to show infinity. Repeat using a blank horizontal number line.

Have the students point to zero on the vertical number line. Tell them, "Move up four. Where would you be?" *Positive four.* "Start at zero and move down four. Where are you now?" *Negative four.* Explain that both movements were for the same distance. Since +4 and -4 are both 4 units away from zero, they are called **opposites**. Find other opposite movements from zero on the vertical and horizontal number lines, e.g.:

up five, down five (+5 and -5)
right eight, left eight (+8 and -8)

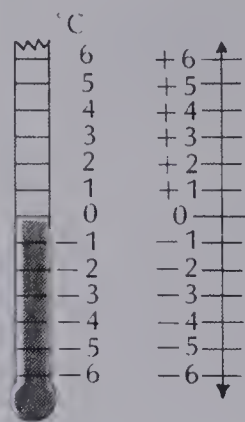
Show how numbers can be paired with their opposites on the number line.



Have the students name the opposites.
"North four." *South four.*
"Win three." *Lose three.*
"East six." *West six.*
"Above nine." *Below nine.*
"Negative five." *Positive five.*

Positive and Negative Numbers

The scale on a thermometer is an example of a number line.



On the number line, numbers above zero are **positive**.

For example, +4 is **positive four**.

Numbers below zero are **negative**.

For example, -4 is **negative four**.

+4 and -4 are **opposites**.

They are the same distance from zero, but in **opposite** directions.

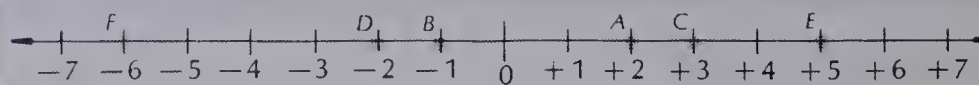
A number line can also be horizontal.



Numbers to the *left* of 0 are **negative**.

Numbers to the *right* of 0 are **positive**.

EXERCISES



What number is at each letter on the number line?

1. A **+2**
2. B **-1**
3. C **+3**
4. D **-2**
5. E **+5**
6. F **-6**

What is the missing number?

7. **-7**
8. **+9**
9. **-12**
10. **0**

Name the opposite of each number.

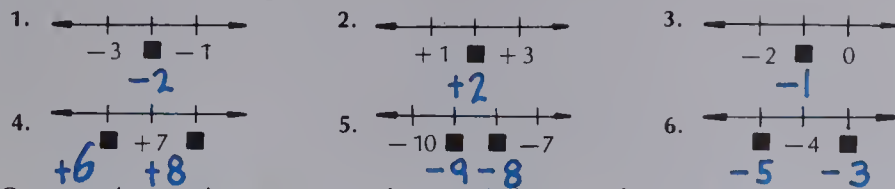
11. +5 **-5**
12. -6 **+6**
13. +10 **-10**
14. -75 **+75**
15. -43 **+43**

Using the Exercises

- Questions 1 to 6 require students to identify locations on a horizontal number line.
- Questions 7 to 10 require the students to identify a location on a number line using the two locations it falls between.
- Questions 11 to 15 require the students to name the opposites of signed numbers.

PRACTICE

What are the missing numbers?



Copy and complete using "right" or "left" for a horizontal number line.

7. +3 is to the Right of -3 8. -7 is to the Left of -6
9. -5 is to the Right of -10 10. +12 is to the Right of +8

Solve.

11. If +5 shows 5 km east, what number shows 4 km west? -4
12. If -200 shows 200 m below sea level, what does +325 show? 325 m above sea level
13. If +25 shows \$25 received, what number shows \$10 spent? -10
14. If -15 shows 15 points lost, what does +8 show? 8 points gained
15. If -8 shows 8 s before blast-off, what number shows 3 s after blast-off? +3
16. If +4 shows members gained, what does -3 show? 3 members lost
17. If -10 shows 10° clockwise, what number shows 30° counterclockwise? +30

Using Your Head

Solve the problem. Use a number line if you wish.

1. Ted and Tina are standing beside each other. Ted walks 3 m forward. Tina walks 4 m in the opposite direction. How far apart are they? 7 m
2. Julius Caesar was born in 100 B.C. Attila was born about 406 A.D. How many years apart were they born? 506
3. Amsterdam is about 600 km west of Berlin. Warsaw is about 550 km east of Berlin. How far apart are Amsterdam and Warsaw? 1150 km

295

Assigning the Practice

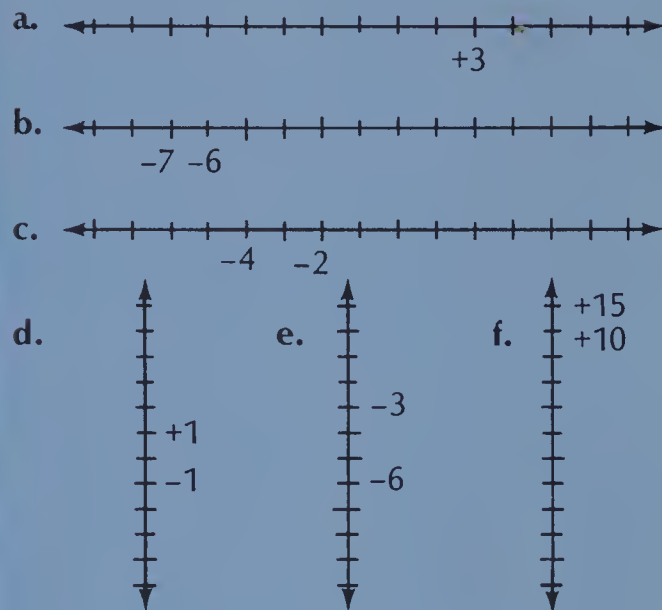
Minimum: 1-14

Average: 4-17

Enriched: 4-17

Reinforcement

Ask the students to finish labelling all marks on the following horizontal and vertical number lines.



Enrichment

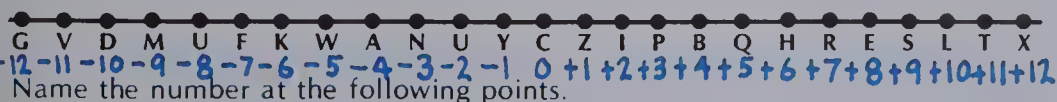
1. Assign *Using Your Head* at the bottom of page 295.
2. Have the students use a globe to find pairs of cities that have opposite latitudes, yet are the same distance from the equator. Pairs of cities having opposite longitudes also can be found.
3. How many degrees does the temperature rise when it goes from:
a. -2°C to 4°C ?
b. -1°C to 8°C ?
c. -3°C to 2°C ?
d. -25°C to 30°C ?

Extra Practice

Worksheet N21

Pages 294-295

Label point C as zero.



Name the number at the following points.

1. A -4 2. R +7 3. Z +1 4. D -10 5. V -11
6. F -7 7. Q +5 8. W -5 9. P +3 10. X +12
11. Point B is the same distance from zero as point A.
12. Point V is the same distance from zero as point I.
13. Point S is the same distance from zero as point M.
14. Write the opposite.
a. K H b. Y Z c. R F d. P N e. V I
f. +3 -3 g. -5 +5 h. -8 +8 i. +12 -12 j. -7 +7

Objective N22

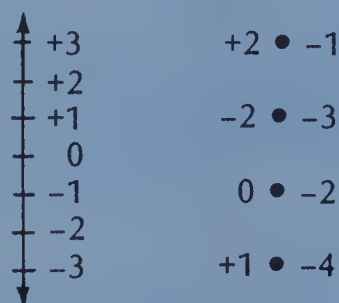
Order positive and negative numbers.

Introducing the Lesson

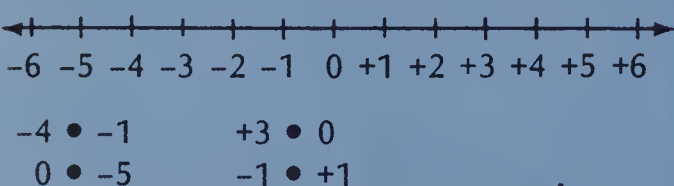
Show labelled horizontal and vertical number lines. Have the students recall that there are an infinite number of positive and of negative numbers, as indicated by the arrows at the ends of the lines. Explain that all positive and negative numbers and zero (which is neither positive nor negative) form a set of numbers called **integers**.

Teaching the Lesson

Refer to a vertical number line as you point out that the **higher** an integer is on the line the **greater** it is. Have the students complete these comparative statements with $<$ or $>$ at the chalkboard using the vertical number line.



Now refer to a horizontal number line. Explain that the further an integer is to the **right** on the line the **greater** it is. Have the students complete these comparative statements with $<$ or $>$ using the horizontal number line.

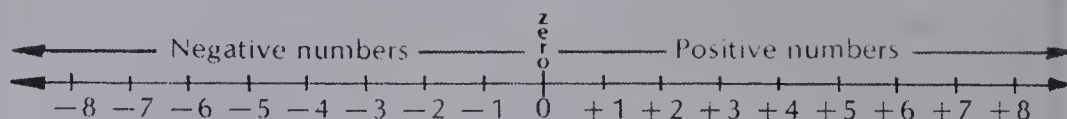


Summarize this activity as the students study the examples at the top of page 296.

Extend the students' ordering skills as you ask them to place these in order starting with the least.

- $+4, -2, -19, +2, -38, +42, -27$
- $+45, -295, +62, +901, -775, -114$
- $-40^{\circ}\text{C}, +25^{\circ}\text{C}, -4^{\circ}\text{C}, +2^{\circ}\text{C}, -18^{\circ}\text{C}, +6^{\circ}\text{C}$

The Integers



Each number on the number line is called an **integer**.

The collection of all the negative numbers, zero, and all the positive numbers is called **the integers**.

Ordering integers on a horizontal number line.

The integer on the *left* is **less than** the integer on the right.

$$+3 < +8$$

$$-3 < +1$$

$$-6 < -5$$

The integer on the *right* is **greater than** the integer on the left.

$$+6 > +4$$

$$+2 > -3$$

$$-4 > -7$$

EXERCISES

Name the next three integers.

- to the right of zero $+1, +2, +3$
- to the left of zero $-1, -2, -3$
- to the right of $+8$ $+9, +10, +11$
- to the left of -7 $-8, -9, -10$

Name the opposite of each number.

- $+2$ -2
- -2 $+2$
- $+37$ -37
- -16 $+16$
- 0 **No opposite**

Copy and complete using "right" or "left".

- $+8$ is to the **Right** of $+6$
- -7 is to the **Left** of -6
- $+1$ is to the **Left** of $+2$
- -3 is to the **Right** of -8
- -4 is to the **Left** of $+1$
- $+5$ is to the **Right** of 0

Copy and complete using $>$ or $<$.

- $+8 > +6$
- $-7 < -6$
- $+1 < +2$
- $-3 < -8$
- $-4 < +1$
- $+5 < 0$
- $-3 < +5$
- $-25 < -30$
- $-50 < -44$

Using the Exercises

- For questions 1 to 4, students need to visualize a horizontal number line as they name integers that are to the right or left of the given integer.
- Questions 5 to 9 require the students to name opposites. Note that zero is the only integer that does not have an opposite.
- Questions 10 to 15 involve determining whether an integer is to the right or to the left of another integer on a number line. This activity also develops comparison skills since the integers to the right are greater.
- Questions 16 to 24 require students to complete integer comparison statements using $<$ or $>$.

PRACTICE

Copy and complete using $>$ or $<$.

1. $+3 < +5$

2. $+2 < -2$

3. $-5 < +10$

4. $-1 < -8$

5. $+5 < +3$

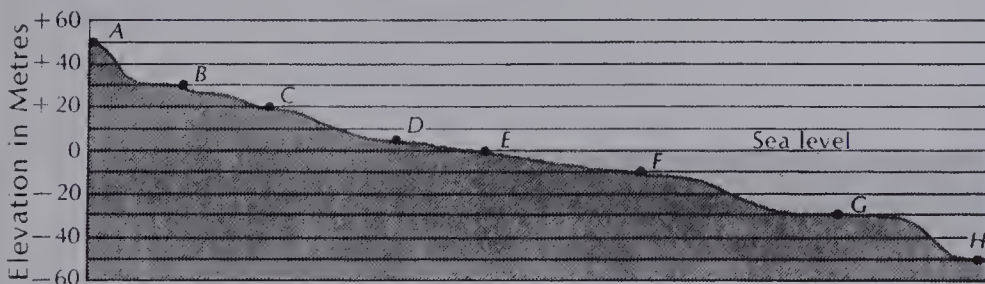
6. $+4 < -1$

7. $-2 < +4$

8. $-18 < -27$

9. $-12 < +1$

Profile of Land and Continental Shelf



10. What is the elevation at A? B? D? E? **A 50 m, B 30 m, D 5 m, E 0**
11. What is the elevation at F? G? H? **F -10 m, G -30 m, H -50 m**
12. How many metres higher is B than C? **10 m**
13. How many metres deeper is H than G? **20 m**
14. What is the difference in elevation between points C and F? **30 m**

Solve.

15. The greatest known depth of the Mediterranean Sea is -4632 m and of the Caribbean Sea, -6946 m. Which sea is deeper? By how much? **The Caribbean, by 2314 m**
16. Which is better, to have -10 or -5 dollars in your account? **-5**

The Bottom of the Sea

Make a bar graph to show the maximum depth of these lakes.

Lake Victoria	82 m	Lake Winnipeg	62 m
Lake Aral	68 m	Lake Nicaragua	70 m
Lake Chad	7 m	Lake Urmia	15 m

297

Assigning the Practice

Minimum: 1-11, 15-16

Average: 4-16

Enriched: 4-16

Reinforcement

1. Ask the students to make a number line showing the integers from -10 to $+10$. Then have them use the number line to answer these questions.

- What is the largest negative integer?
- What is the least positive integer?
- How is zero different from all other integers?
- What is the largest positive integer?
- What is the least negative integer?
- How many odd integers are between -10 and $+10$?
- How many even integers are between -10 and $+10$?

2. Give the students a blank paper thermometer (provided with this *Teacher's Resource Book*). Have them mark the temperatures and label 15°C as A, 10°C as F, 0°C as E, -5°C as B, -10°C as G, and -15°C as D. Have them use the thermometer to answer these questions.

- How many degrees does the temperature rise when it goes from G to A?
- How many degrees does the temperature drop when it goes from E to B?
- How many degrees does the temperature rise when it goes from D to F?

Enrichment

1. Assign *The Bottom of the Sea* on page 297.

2. Ask the students to prepare an elevation and depth profile similar to that on page 297 using these facts.

Mountain Heights

Mt. McKinley	6194 m
Mt. Logan	6050 m
Mt. Everest	8948 m
Mt. Kilimanjaro	5899 m
Mt. St. Elias	5489 m

Ocean Depths

Puerto Rico Trough	9200 m
Mariana Trench	11 022 m
Mindanao Trench	10 497 m
Sandwich Trench	8428 m
Java Trench	7450 m

Extra Practice

Worksheet N22

Pages 296-297

Write $<$ or $>$.

1. $+7 < +9$

2. $-3 > -5$

3. $+1 > -1$

4. $-8 < +8$

5. $-4 > -7$

6. $-2 < +3$

7. $+4 > -6$

8. $-10 < +10$

9. $0 > -2$

Write in order starting with the least.

10. $+4, -1, +6, -12, 0, -2, +3, -7$ **$-12, -7, -2, -1, 0, +3, +4, +6$**

11. $+3, +9, -2, +8, -45, +11, -20$ **$-45, -20, -2, +3, +8, +9, +11$**

12. $+212, +45, -526, 0, -27, +100, -100$ **$-526, -100, -27, 0, +45, +100$**

13. $-32, +73, -74, -6, +9, -81, +85$ **$-81, -74, -32, -6, +9, +73, +85$**

Complete.

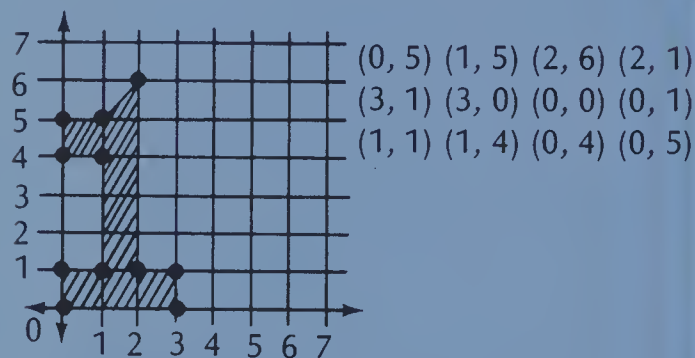
14. $-20, -15, -10, -5, 0, +5, +10, +15, +20$

Objective GR6

Locate and plot points on the full coordinate plane.

Introducing the Lesson

Review the coordinate system for positive numbers as presented on page 258. Show the following grid on the chalkboard or overhead projector. Have the students point out the *horizontal* and *vertical* axes and the *origin*. Recall how *ordered pairs* name locations on the grid. The first coordinate indicates horizontal movement from the origin and the second coordinate indicates vertical movement. Students can take turns plotting and joining these points, which form a picture.



Teaching the Lesson

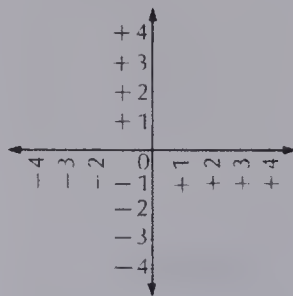
Ask, "Why do the horizontal and vertical axes have arrows at their ends?" The students should recognize that the axes are number lines showing only positive integers. Extend the axes (number lines) to show negative integers. Explain that the grid is now divided into four parts and that locations on the grid can be determined with ordered pairs. Have the students locate the following points on the grid. Remind them that the first coordinate indicates the horizontal move from the origin (right or left) and the second coordinate indicates the vertical move (up or down).

$(+6, -2)$ $(-3, -4)$ $(-5, +1)$ $(+2, +2)$

Mark each of several locations with a point on the four-part grid and label the points with a letter. Have the students name the ordered pairs for each of these locations.

Summarize the lesson's activities as you read and discuss the top of page 298.

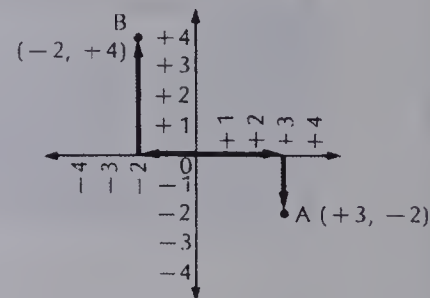
Positive and Negative Coordinates



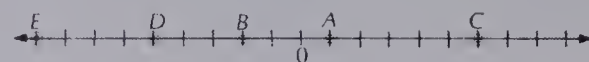
The horizontal and vertical number lines divide the grid into four parts.

Points are located on the grid as shown. A $(+3, -2)$ means, starting from the origin, go 3 right and 2 down to locate A.

B $(-2, +4)$ means, starting from the origin, go 2 left and 4 up to locate B.



EXERCISES



Name the integer at the point.

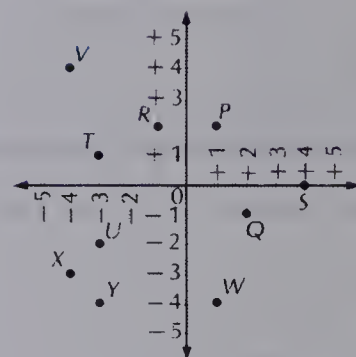
1. A $+1$ 2. B -2 3. C $+6$ 4. D -5 5. E -9
6. F $+3$ 7. G -5 8. H -1 9. I $+6$ 10. J -2

Name the point located by the ordered pair.

11. $(+1, +2)$ P 12. $(-3, +1)$ T
13. $(+2, -1)$ Q 14. $(-3, -2)$ U
15. $(-1, +2)$ R 16. $(+4, 0)$ S

Write the ordered pair for the point.

17. V $(-4, +4)$ 18. W $(+1, -4)$
19. X $(-4, -3)$ 20. Y $(-3, -4)$



Using the Exercises

- Questions 1 to 10 require the students to name positive and negative integers located on a vertical and horizontal number line.
- Questions 11 to 16 require the students to locate a point on a grid from an ordered pair. Remind the students that the first move is always horizontal.
- Questions 17 to 20 require the students to write an ordered pair for a point located on the grid.

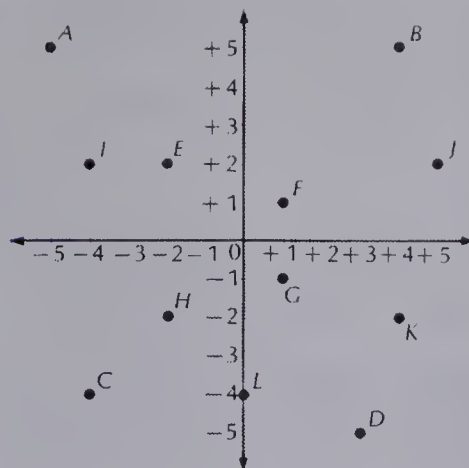
PRACTICE

Name the point located by the ordered pair.

1. $(+4, +5)$ **B**
2. $(-5, +5)$ **A**
3. $(+3, -5)$ **D**
4. $(-2, +2)$ **E**
5. $(-4, -4)$ **C**
6. $(-2, -2)$ **H**

Write the ordered pair for the point.

7. **F** $(+1, +1)$
8. **G** $(+1, -1)$
9. **I** $(-4, +2)$
10. **J** $(+5, +2)$
11. **K** $(+4, -2)$
12. **L** $(0, -4)$



13. Draw horizontal and vertical number lines on grid paper.

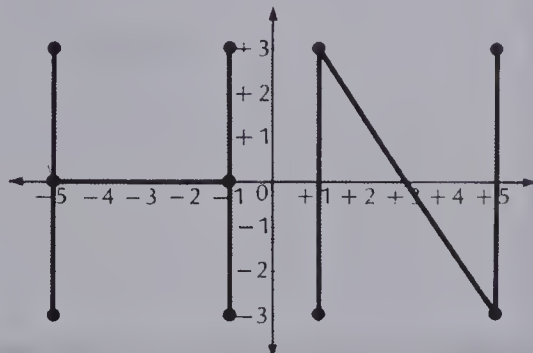
Graph these points: $L(+4, -4)$, $M(-2, +5)$, $N(-3, -4)$.

Code Your Own

On a coordinate grid, print your initials or those of a friend. Make up a code for the initials using ordered pairs. When you want the person following the code to lift his or her pencil and start a new line, draw a Δ .

Here is an example.

- $(-5, +3) (-5, -3) \Delta (-1, +3)$
 $(-1, -3) \Delta (-5, 0) (-1, 0) \Delta$
 $(+1, +3) (+1, -3) \Delta (+1, +3)$
 $(+5, -3) \Delta (+5, +3) (+5, -3) \Delta$



299

Assigning the Practice

Minimum: 1-12

Average: 1-13

Enriched: 1-13

Reinforcement

1. In pairs, have the students play "Battle-ship". Each player has a four-quadrant grid. The object of the game is to successfully hide a submarine, a battleship, and a destroyer on the grid. In turn, players name an ordered pair to try to "hit" an opponent's ship. If there is a boat at that point, a "hit" is scored and the ship is destroyed. The winner is the first person to sink all of the opponent's ships.

Variation: Use north, south, east, west directions rather than positive and negative integers.

2. Have the students locate and join these points with a ruler on a four-quadrant grid. Then ask them to identify as specifically as possible the polygon formed.

- a. $(-2, -2) (-2, +4) (+2, -2)$
- b. $(-2, -3) (+2, -3) (0, +5)$
- c. $(-3, -1) (-1, +1) (+2, -1) (+4, +1)$
- d. $(-2, +3) (-2, -2) (+1, -1) (+1, +2)$

3. Ask the students to locate and join these points with a ruler on a four-quadrant grid. If done correctly, a picture will be made.

- $(0, +4) (+1, +2) (+3, +3) (+2, +1) (+4, 0)$
 $(+2, -1) (+3, -3) (+1, -2) (0, -4) (-1, -2)$
 $(-3, -3) (-2, -1) (-4, 0) (-2, 1) (-3, 3)$
 $(-1, 2) (0, +4)$

Enrichment

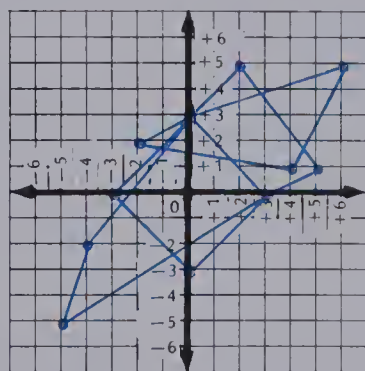
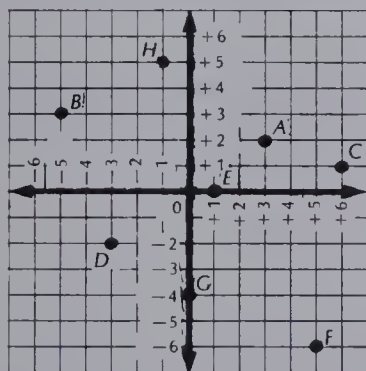
1. Assign Code Your Own at the bottom of page 299.

2. Encourage the students to draw a picture on a grid and then write the set of ordered pairs from which other students could duplicate the picture.

Extra Practice

Worksheet GR6

Pages 298-299



Write the ordered pair for the point.

1. **A** $(+3, +2)$
2. **B** $(-5, +3)$
3. **C** $(+6, +1)$
4. **D** $(-3, -2)$
5. **E** $(+1, 0)$
6. **F** $(+5, -6)$
7. **G** $(0, -4)$
8. **H** $(-1, +5)$

Plot the points. Join them in order.

Name the figure. **Square**

9. $(0, +3) (+3, 0) (0, -3) (-3, 0)$

10. $(+4, +1) (-2, +2) (+6, +5)$ **Triangle**

11. $(+2, +5) (+5, +1) (-5, -5) (-4, -2)$

Quadrilateral

Objective PS13

Use patterns to solve problems.

Introducing the Lesson

Review arithmetical and geometrical patterns that have been studied previously with examples like the following. As you discuss them, stress that the fascinating feature of patterns is that they can be continued forever once the pattern rule is known.

- 1, 12, 24, 36, . . .
- 1, 5, 4, 20, . . .
- . . .
- $(-1, +1)$ $(-2, +3)$ $(-4, +9)$. . .
- $(+8, -1)$ $(-7, +2)$ $(+6, -3)$. . .
- . . .

g. Number of people	1	2	3	4	5
Cost of tickets	\$4.75				

Teaching the Lesson

Read the pyramid problem at the top of page 300. Use wooden blocks to simulate the problem. Point out that the solution can be reached without counting each can (wooden block) if a pattern can be found.

Build a four-layer pyramid. Guide the students toward finding a pattern by providing a chart of the amount of cans (blocks) in each layer.

Layers	1	2	3	4
Cans	1	4	9	16

Let the students apply the pattern rule from the smaller pyramid to the larger one.

1, 4, 9, 16, 25, 36, 49, 64, . . .

Rule: $1^2, 2^2, 3^2, 4^2, \dots$

Give the students toothpicks for solving the two following problems.

a. How many toothpicks are needed to make five squares with no sides being shared?

b. How many toothpicks are needed to make five squares with sides shared?

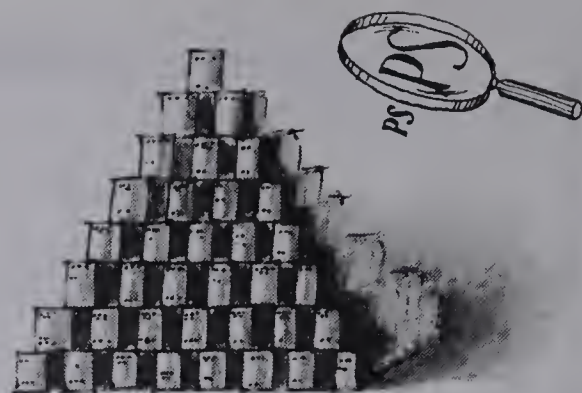
After making a few toothpick squares and recording the amount of toothpicks needed, the students should see the pattern formed. Thus, the solution can be predicted from the pattern rule.

	4, 8, 12, . . .	

Using Patterns

A supermarket manager wants to build a square pyramid with cans of apple juice. The bottom layer is to be 8 cans wide.

How many cans will the display use?



Solution

Work backwards and find a pattern.

Start with the top layer and figure out the pattern.

- on the top, 1 can
- next layer, 2 cans wide, or 4 cans (2×2)
- next layer, 3 cans wide, or 9 cans (3×3)
- next layer, 4 cans wide, or 16 cans (4×4)
-
- 8 layers
-

The pyramid will use $1 + 4 + 9 + 16 + 25 + 36 + 49 + 64$ or 204 cans.

EXERCISES

Copy each pattern and show the next three numbers or figures.

- 1, 3, 5, 7, 9, . . . *11, 13, 15*
- 4, 8, 12, 16, . . . *20, 24, 28*
- 1, 2, 4, 8, 16, . . . *32, 64, 128*
- 1, 2, 4, 7, 11, . . . *16, 22, 29*
- 1, 2, 4, 12, 48, . . . *240, 1440, 10080*
- 1, 4, 3, 6, 5, 8, . . . *7, 10, 9*
- . . . *25, 36, 49*
- $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots$ *$\frac{1}{5}, \frac{1}{6}, \frac{1}{7}$*
- . . .
- . . .

Using the Exercises

- Questions 1 to 6 require the students to study a sequence of numbers, determine the pattern rule, and name the next three numbers of the pattern.
- Questions 7 to 10 involve fraction and geometric patterns for the students to continue. Have the students verbalize the pattern rules.

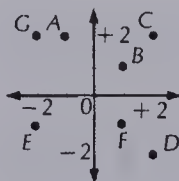
PRACTICE

Solve by using a pattern.

1. A store is ordering sales brochures. The printer charges \$15 for 100 brochures, \$20 for 200, \$25 for 300, and so on. How much will 600 brochures cost? **\$ 40**
2. Complete the pattern:
 -10°C , -9°C , -7°C , -4°C , $\square^{\circ}\text{C}$. **0**
3. Pierre made a deal with his parents about his homework. If he does his homework on time, they agree to pay him 1¢ the first day, 2¢ the second day, 4¢ the third day, 7¢ the next day, 11¢ the next day, and so on. If Pierre does his homework on time for 10 days, how much money will he receive altogether? **\$1.75**

REVIEW

- Copy and complete the pattern. State the rule.
- GR5
 1. (2, 1) (4, 2) (6, 3) (8, 4) $(\square, \square) (\square, \square) \div 2$
 2. (1, 2) (2, 3) (3, 4) (4, \square) $(\square, \square) (\square, \square) + 1$
- M16
 Which temperature is lower?
 3. $+2^{\circ}\text{C}$ or -10°C 4. -6°C or -12°C 5. -20°C or $+5^{\circ}\text{C}$
- N21
 What are the missing integers?
 6. $\leftarrow -3 \quad \square \quad -1 \quad \square \rightarrow$ 7. $\leftarrow \square \quad 0 \quad \square \rightarrow$
- N22
 Copy and complete using $>$ or $<$.
 8. $+3 \bullet +7$ 9. $-2 \bullet -8$ 10. $-5 \bullet +4$
- GR6
 Name the point located by each ordered pair.
 11. $(+1, +1)$ 12. $(+2, -2)$
 Name the ordered pair.
 13. G $(-2, +2)$ 14. F $(+1, -1)$



301

Assigning the Practice

Minimum: 1-3

Average: 1-3

Enriched: 1-3

Review Exercises

Questions	Objective	Pages
1-2	GR5	290-291
3-5	M16	292-293
6-7	N21	294-295
8-10	N22	296-297
11-14	GR6	298-299

Reinforcement

1. Give the students toothpicks to solve these problems.

a. How many toothpicks are needed to make six triangles if the sides are not shared? if the sides are shared?

b. How many toothpicks are needed to make five pentagons if the sides are shared? if the sides are not shared?

2. A young mathematician used the following method to find the sum of the first ten counting numbers.

$$10 + 1 = 11$$

$$9 + 2 = 11$$

$$8 + 3 = 11 \quad \text{Five 11s} = 55$$

$$7 + 4 = 11$$

$$6 + 5 = 11$$

Ask the students to study and use this method as they find the sum of the first 16, 20, 30, 50, and 100 counting numbers.

Enrichment

1. Ask the students to graph the ordered pairs in the chart so they can continue the pattern and complete the chart.

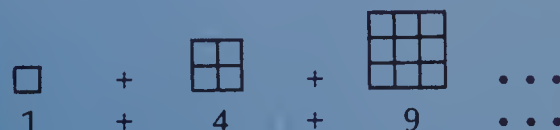
a.

Rule: -1	
3	2
2	1
1	
0	
-1	
-2	

b.

Rule: $\times 2, -4$	
3	2
2	0
1	
0	
-1	
-2	

2. Have the students determine the pattern rule for determining the number of squares on a 8×8 grid. (Hint: Count one kind of square at a time.)



Extra Practice

Worksheet PS13

Pages 300-301

Complete the pattern.

1. $(+1, -4)$ $(+2, -8)$ $(+3, -12)$ $(+4, -16)$ $(+5, -20)$ $(+6, -24)$ $(+7, -28)$
2. 1, 1, 2, 3, 5, 8, 13, 21, 34
3. $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \frac{1}{64}$
4. 10:48 A.M., 10:52 A.M., 10:56 A.M., 11:00, 11:04, 11:08

Solve by using a pattern.

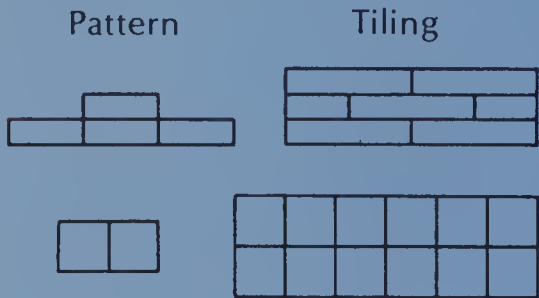
5. A certain species of bacteria grows by splitting in half every few minutes. After 1 division, there are 2 bacteria. After 2 divisions, there are 4 bacteria. After 3 divisions, there are 8 bacteria, and so on. How many bacteria will there be after 10 divisions? **1024**
6. It costs \$3.90 to make a 3 min telephone call from Kelsey to Tignish, \$4.80 for a 4 min call, \$5.70 for a 5 min call, and so on. How much will a 10 min call cost? **\$ 10.20**

Objective G11

Identify tessellations and figures that can be used to make tessellations.

Introducing the Lesson

Have the students study tiling patterns in the floor, wall, and ceiling. Point out that each tile shape covers the surface without gaps or overlapping. These tiling patterns are called **tessellations**. Ask the students to describe these tiling patterns.



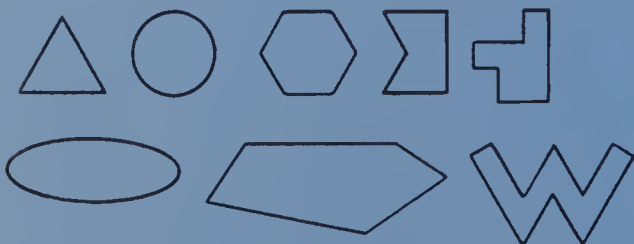
Let the students describe different tiling patterns they have seen in sidewalks, windows, etc.

Teaching the Lesson

Read and discuss the top of page 302. Point out the three tiling patterns. (Note how other patterns are made with the addition of different colours.)

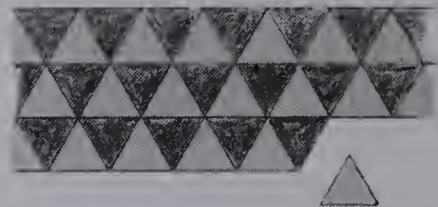
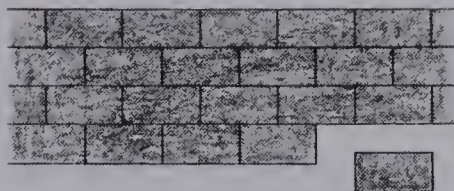


Provide each student with several cardboard figures similar to the following and several sheets of blank paper. Ask them to trace each figure over and over on a piece of paper to determine whether or not the figure will tessellate (cover without gaps or overlapping).



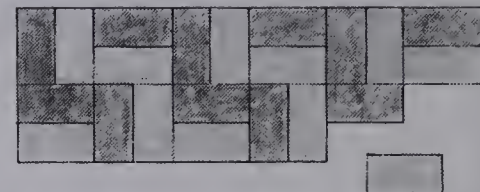
Once the tessellating figures have been found, students can create further patterns on their tiled surfaces by adding different colour patterns.

Tiling Patterns



Congruent figures can sometimes cover a surface without gaps or overlapping.

The pattern is called a **tessellation**.



EXERCISES

Will the figure tile a surface?

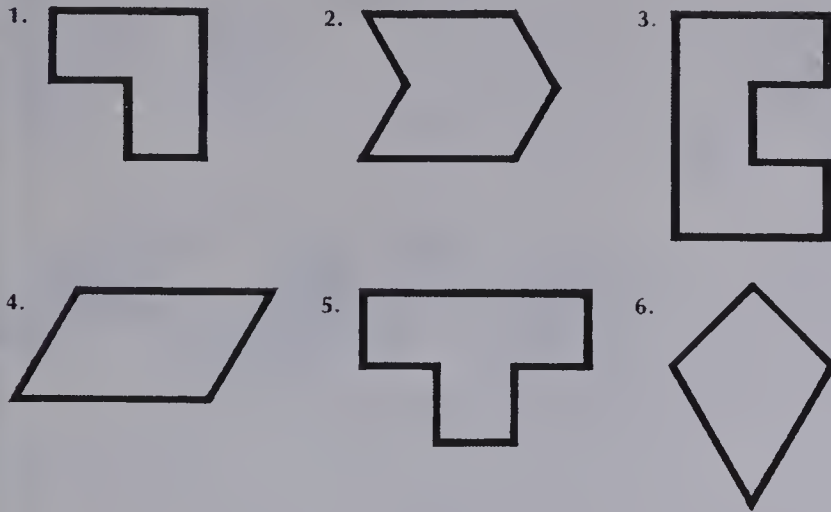
- Yes
- Yes
- Yes
- No
- Yes
- Yes
- Yes
- No
- Yes

Using the Exercises

- Questions 1 to 9 require the students to determine whether the pattern illustrated shows a tessellation (or completely tiled) surface.

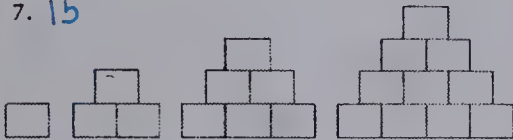
PRACTICE

Trace each figure over and over until your page is covered.



How many figures will be in the next pile?

7. 15



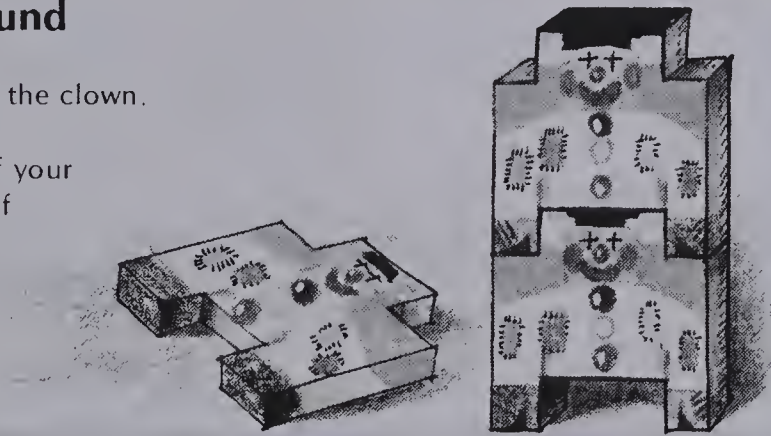
8. 25



Clowning Around

Trace the picture of the clown.

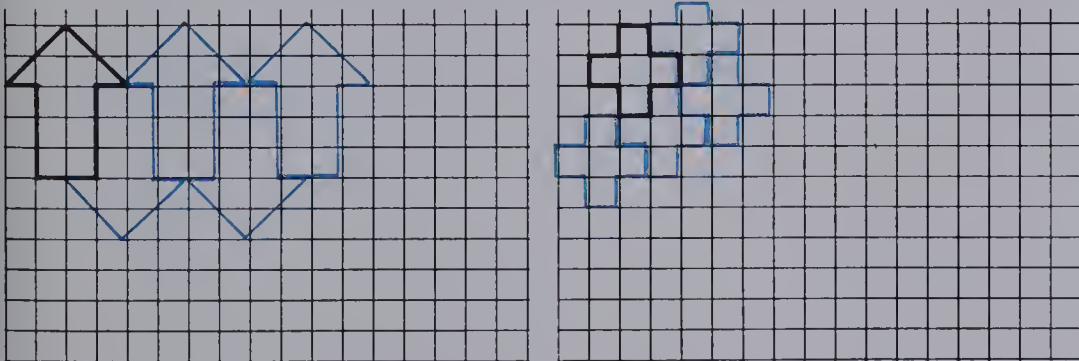
Cover the surface of your page with tracings of the clown.



303

Extra Practice

Tile the surface with the figure. Use different colours.



Worksheet G11

Pages 302-303

Assigning the Practice

Minimum: 1-6

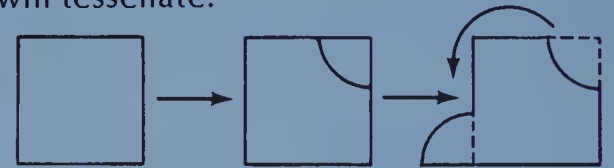
Average: 1-6

Enriched: 1-8

Reinforcement

1. Assign *Clowning Around* at the bottom of page 303.

2. Ask the students to cut off the corner of a square and attach it to the opposite side, as shown below. Then have them see if the resulting figure will tessellate.



3. Give the students graph paper to test the following.

a. Will a right (isosceles, or equilateral) triangle tessellate?

b. Will all quadrilaterals tessellate?

Enrichment

1. Provide several sheets of graph paper. Have the students investigate whether various polyominoes will tessellate.

a. tetraminoes (4 squares)



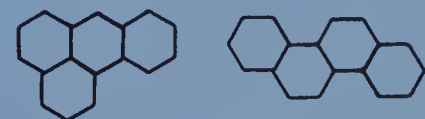
b. pentominoes (5 squares)



c. hexaminoes (6 squares)



2. Polyhexes of different kinds can also be investigated for tessellation possibilities. For example, two tetrahexes:



Objective G12

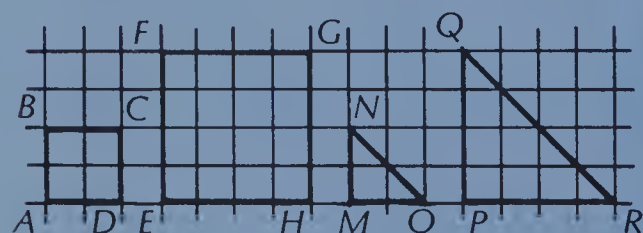
Recognize similar figures and the corresponding parts of similar figures.

Introducing the Lesson

Give each student a sheet of graph paper. Ask them to make 2×2 squares with a ruler. Ask, "Are these figures the same size and shape?" Review that they can be called **congruent** squares since all sides and angles match or are equal. Repeat, only this time have the students make congruent right triangles with a base and a height of 2 units.



Ask the students to make a square and a right triangle that is double the size of those already made. Ask, "How long would the sides of the square be? the base and height of the triangle?" Once the figures have been made, ask whether the pairs of squares and triangles are congruent. Point out that they are the same shape, but not the same size; hence, they are not congruent. They are **similar figures**.



Point out that the congruent squares and right triangles drawn earlier are also **similar**; but the similar squares and right triangles are not also **congruent**.

Teaching the Lesson

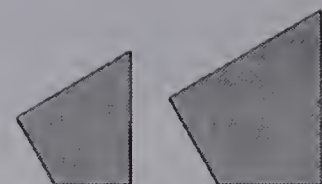
Discuss the reasons why the above squares and right triangles are *similar figures*.

a. The corresponding sides are proportional. Note the lengths, for example, of segments AD and EH and segments AB and EF . Both sets of sides are proportional to each other. $2:4 = 2:4$. The corresponding sides of the similar right triangles are also proportional.

(Continued in Reinforcement section.)

Similar Figures

Figures that have exactly the same shape (but may be different sizes) are called **similar figures**.



Angle A is the same size as angle D.
Angle B is the same size as angle E.
Angle C is the same size as angle F.



Corresponding angles of similar figures are equal.

EXERCISES

Name all the pairs of corresponding angles.

1. 2. 3. 4. 5. 6. 7.

304

Using the Exercises

- Questions 1 to 5 require the students to identify the corresponding angles of the pairs of similar figures. Note that the figures have been turned in question 4 and flipped in question 5.
- Questions 6 and 7 involve naming the equal or congruent angles of pairs of similar figures.

PRACTICE

Name the pairs of corresponding angles in these pairs of similar figures.

1. $\triangle ABC \sim \triangle XYZ$
 $A-X$
 $B-Y$
 $C-Z$

2. $\triangle DEF \sim \triangle GHI$
 $D-T$
 $E-W$
 $F-V$
 $G-U$

3. $\triangle KLM \sim \triangle PQR$
 $K-P$
 $H-S$
 $I-R$
 $J-Q$

4. $\triangle DKE \sim \triangle LFM$
 $D-K$
 $E-L$
 $F-M$

5. $\triangle OGH \sim \triangle PQR$
 $O-G$
 $P-H$
 $Q-I$
 $R-J$
 $S-K$

6. $\triangle ADB \sim \triangle CXZ$
 $A-Z$
 $B-Y$
 $C-X$
 $D-W$

Down Under

Use 1 cm square grid paper to copy the map. What country is it? *Australia.*



305

Assigning the Practice

Minimum: 1-6

Average: 1-6

Enriched: 1-6

Reinforcement

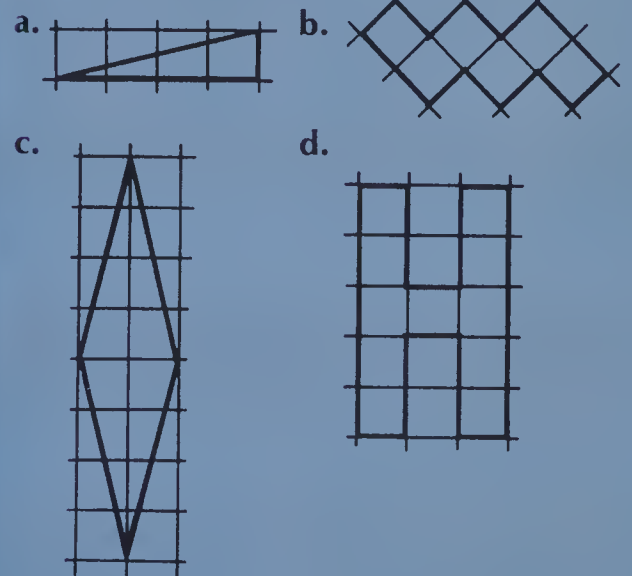
b. The corresponding angles are equal (or congruent). The 90° angles of the squares and in the right triangles can easily be seen as equal. Students should measure the other two sets of corresponding angles in the triangles to prove their congruence.

Have the students make other similar figures on the graph paper. Have them measure all corresponding angles with a protractor to prove their congruence. Discuss also the corresponding, proportional sides.



"Make these. Then double or triple them in size."

Provide the students with rulers, protractors, and graph paper. Ask them to make the following figures and then to double and/or triple them in size. Then ask them to name the corresponding angles which are congruent and sides which are proportional.



Enrichment

Assign *Down Under* at the bottom of page 305. Point out that the larger the grid squares are, the more the shape of Australia will be enlarged. Since the size and not the shape changes, the maps are similar and proportional, but not congruent.

Extra Practice

Make a similar figure that is double in size.

Name the corresponding angles of the similar figures.

1. $\triangle ABC \sim \triangle DEF$

2. $\triangle RST \sim \triangle KLM$

1. Corresponding, equal angles:
- A and G
 - B and E
 - C and F
 - D and H
2. Corresponding, equal angles:
- R and J
 - S and K
 - T and L
 - U and M
 - V and N
 - W and O
 - X and P
 - Y and Q

Worksheet G12

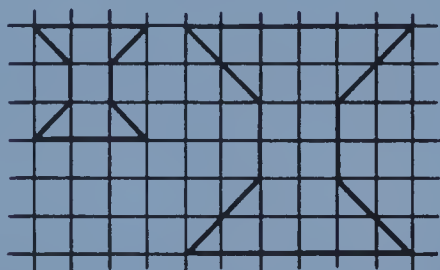
Pages 304-305

Objective G13

Read scale drawings and calculate distances from scales.

Introducing the Lesson

Display the following similar figures. Ask the students to point out the corresponding, proportional sides. Explain that each side of the double figure was enlarged using the scale 1:2 (or every 1 cm became 2 cm).

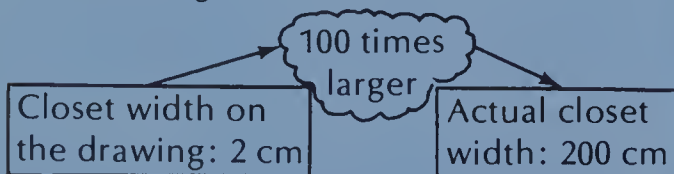


With graph paper and rulers, have the students make proportional drawings of this figure that use the scale 1:3, 1:4, or more.

Teaching the Lesson

Discuss the two scale drawings at the top of page 306. Point out the scale for each. Explain that the actual first floor of the house is 100 times larger than the drawing, since the scale is 1:100 (every 1 cm is 100 cm). The actual book is 6 times larger than the drawing, since the scale is 1:6 (every 1 cm is 6 cm).

Show the students how the dimensions of the rooms of the house can be found using the scale 1:100.



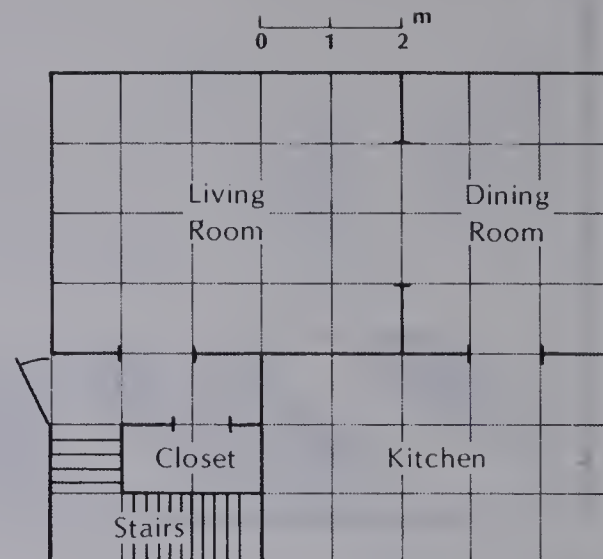
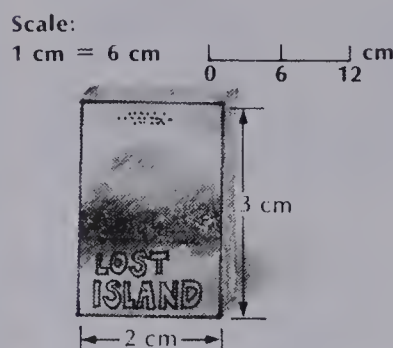
Have the students name several actual dimensions of the rooms or book using the appropriate scales.

Point out the map of Canada on the first page of this book. Note the map scale. Explain that for every centimetre on the map, there are 200 actual kilometres.

Ask the students to measure the distances between various cities in centimetres and then use the scale to tell the actual distance in kilometres.

Scale Drawings

This drawing of the first floor of a house uses the scale 1:100 (one to one hundred). That is, 1 cm on the drawing represents 100 cm (or 1 m) of the real floor. Look at the drawing to see how the scale is shown.



The drawing of the book uses the scale 1:6. The drawing of the book is 3 cm long. So, the real length of the book is $6 \times 3 \text{ cm} = 18 \text{ cm}$.

EXERCISES

- The drawing of the dining room is 3 cm wide.
How wide is the real dining room? **300 cm or 3 m**
- The drawing of the living room is 5 cm long.
How long is the real living room? **500 cm or 5 m**
- How wide and how long is the drawing of the kitchen?
3 cm wide, 5 cm long
- What are the measurements of the real kitchen?
300 cm, 500 cm
- How long is the real house? How wide is it?
800 cm long, 700 cm wide or 8 m by 7 m
- How wide is the drawing of the book?
2 cm
- How wide is the real book?
12 cm
- How many times bigger are the measurements of the real book?
6
- Suppose the scale was 1:7. What would be the measurements of the real book?
21 cm long, 14 cm wide

Using the Exercises

- Questions 1 to 5 require the students to use the scale drawing of the house to determine its real lengths. Remind the students that the scale is 1:100 for this drawing. Each dimension is, therefore, 100 times greater than it is shown on the drawing.
- Questions 6 to 9 involve determining lengths of the real book that has been scaled down in the drawing. The scale is 1:6. Each actual dimension is 6 times larger than it is on the drawing. Note the scale changes to 1:7 in the last question.

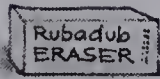
PRACTICE

Solve.

The scale is 1:3.

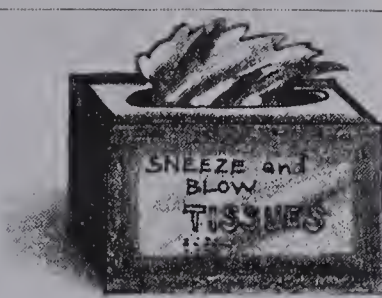
6 cm

1. How long is the real eraser?



2. How wide is the real box of tissues?

12 cm



The scale is 1:5.

3. How long is the real pencil?

25 cm

4. How tall is the real cup?

10 cm



5. A scale is 1:2. How long is the real object if the drawing is 1 cm? 2 cm? 3 cm? 4 cm?

2 cm 4 cm 6 cm 8 cm

6. A scale is 1:4. How long is the real object if the drawing is 1 mm? 1 cm? 2 cm? 5 cm?

4 mm 4 cm 8 cm 20 cm

7. Copy and complete.

Scale	Drawing	Real Object
1:10	6 cm	
1:5		25 cm
	2 cm	4 cm

60 cm

5 cm

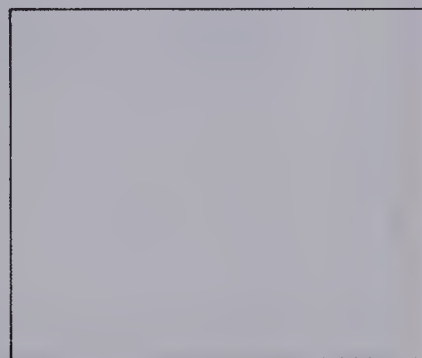
1:2

Scaling Down

Helen's back yard is 30 m long and 20 m wide. She wants to make a map of it that will fit in this rectangle. What scale should she use? What will the length and width of her map be?

1 cm : 5 m

5 cm long, 4 cm wide



307

Assigning the Practice

Minimum: 1-6

Average: 1-7

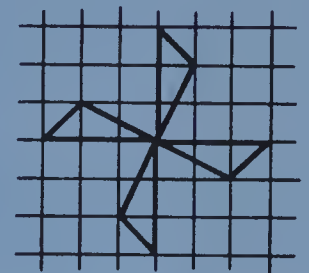
Enriched: 1-7

Reinforcement

1. Give the students graph paper and rulers. Ask them to enlarge the following drawings to the given scale.

a. 1:5

b. 1:3



2. Have the students complete the distance chart on page 13 using the given map scale. (They can do this if they have not already done so earlier in the year.)

3. Ask the students to enlarge the drawings made on a grid from the worksheet provided with this *Teacher's Resource Book*.

4. Provide the students with transparent enlargement grids. Have them place the grid over their favourite comic strip character and enlarge the character onto a sheet of paper using the grid. Display their work.

5. Ask the students to measure one floor of their house or apartment and then make a floor plan using the scale 1:100.

6. Provide maps of various countries to small groups of students. Prepare a list of questions about the actual distances between cities to accompany each map. The students are to measure the distances and use the map scale to answer the questions.

Enrichment

1. Assign *Scaling Down* at the bottom of page 307.

2. Ask the students to measure the actual length and width of the school building. Then they are to make a scale drawing of it.

Extra Practice

Worksheet G13

Pages 306-307

Find the distances between each pair of cities.



Kilometres	Bastia	Ajaccio	Alghero	Nuoro	Muravera	Caligari
Bastia	X	100	260	280	360	400
Ajaccio	100	X	160	200	300	320
Alghero	260	160	X	80	160	160
Nuoro	280	200	80	X	100	120
Muravera	360	300	160	100	X	40
Caligari	400	320	160	120	40	X

Objective PS14

Solve two-step and three-step problems.

Introducing the Lesson

Review simplifying number expressions with examples like the following. If necessary, also review the order of operations rules.

- $30 - 2 \times 6$
- $8 \times 9 - 6 \div 3$
- $30 - (5 + 8)$
- thirty divided by two + three
- sixteen minus five times two
- the difference between eight times three and four times four

Teaching the Lesson

Write the following expressions on the chalkboard. Ask the students to think of word problems involving money for the expressions.

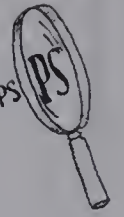
- $\$100 - (5 \times \$14.95)$
- $(4 \times \$0.79) + (6 \times \$1.25)$

Solve the problems. Point out how the first example required two steps (multiply and subtract) while the second example required three steps (multiply, multiply, and add).

Read and discuss the problem at the top of page 308. Before reading the two possible solutions, let the students suggest their own. Then think through and compare the solutions given on the page. Note that the three steps of **Solution A** (multiply, multiply, and subtract) can be written in the expression $(35 \times 75) - (35 \times 67)$. The two steps of **Solution B** (subtract and multiply) can be written in the expression $(0.75 - 0.67) \times 35$.

Point out that two- and three-step problems often have more than one possible solution. It is important then for the students to carefully study the facts given in a problem and follow the four problem-solving steps as they work toward its solution.

Two-Step and Three-Step Problems



Rita had prints made of pictures taken at a class outing. Each print cost her 67¢. She had 35 prints made and sold them to classmates at 75¢ each.

How much money did she make?

Solution A

Step 1: Cost of 35 prints at 67¢ each.

$$35 \times \$0.67 = \$23.45$$

Step 2: Selling price of 35 prints at 75¢ each.

$$35 \times \$0.75 = \$26.25$$

Step 3: Profit = $\$26.25 - \23.45
= $\$2.80$

Rita made $\$2.80$ profit.

Solution B

Step 1: Profit on each print.

$$\$0.75 - \$0.67 = \$0.08$$

Step 2: Profit on 35 prints.

$$35 \times \$0.08 = \$2.80$$



EXERCISES

Complete the steps in solving the problem.

- Jacob bought 2 packs of paper at 89¢ each and a notebook for $\$2.95$. What was the total cost?

Step 1: Cost of paper: $2 \times \$0.89 = \blacksquare$ $\$1.78$

Step 2: Total cost: $\$2.95 + \blacksquare = \blacksquare$ $\$4.73$
 $\$1.78$

- A section of an auditorium has 11 rows with 12 seats in each row. The tickets for the seats in this section cost $\$5$. If the section is filled, how much money is taken in?

Step 1: Total number of seats: $11 \times 12 = \blacksquare$ 132

Step 2: Money taken in: $\blacksquare \times \$5 = \blacksquare$ $\$660$
 132

- A wall of a building measures 30 m by 6 m. One can of paint costs $\$21.95$ and will cover 60 m^2 . How much will it cost to paint the wall?

Step 1: Area of the wall: \blacksquare 180 m^2

Step 2: Number of cans of paint needed: \blacksquare 3

Step 3: Cost of paint: \blacksquare $\$65.85$

308

Using the Exercises

- Questions 1 to 3 can be used as an oral, guided lesson. The two or three steps needed for the solution of the problems are given to aid the students in deciding what to do. The solution expressions for each problem can also be shown and discussed.

1. $(2 \times \$0.89) + \$2.95 = \blacksquare$

2. $(11 \times 12) \times \$5 = \blacksquare$

3. $30 \times 6 : 60 \times \$21.95 = \blacksquare$

PRACTICE

Solve.

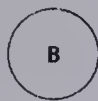
- George and Jenny budgeted \$1500 for a vacation. They plan to spend \$378 on lodging, \$225 on food, and \$769 on transportation. How much money will be left for other items? **\$128**
- A daily interest savings account with \$10 000 in it earned \$4.11 a day for the first 9 days of June. The interest rate went up and it earned \$4.25 a day for the next 21 days. How much interest did the account earn in June? **\$126.24**
- Chang had 3 h to do as he pleased. He read for an hour, dozed for 20 min, talked to a friend for 20 min, and played tennis for 40 min. How much time did he have left? **40 min**
- Tony mowed lawns for 3 h and was paid \$2/h. He cleaned a basement in 2.5 h and was paid \$2.50/h. How much money did he earn? **\$12.25**
- Christine babysits for \$1.50/h. She can usually babysit 6 h/week. How many weeks will it take her to earn \$50? **About 6**

REVIEW

G11

- Which figure could be used to tile a surface?

C



G12

Name pairs of corresponding angles in the similar polygons.



A-X B-Y C-Z



L-P M-Q N-R O-S

Solve.

G13

- A drawing is 3 cm long. The scale is 1:4. How long is the real object? **12 cm**
- A drawing is 5 cm wide. The scale is 1:3. How wide is the real object? **15 cm**

309

Assigning the Practice

Minimum: 1-4

Average: 1-5

Enriched: 1-5

Review Exercises

Questions	Objective	Pages
1	G11	302-303
2-3	G12	304-305
4-5	G13	306-307

Reinforcement

1. Give each student a page from a catalog. Have them make up word problems that require:

- addition and multiplication
- subtraction and multiplication
- addition and division
- addition and subtraction.

The students can exchange and solve the problems.

2. Display the following information. Have the students make up two- and three-step problems from the information.

Ski Rental

Skis:	\$10/day	3% tax on all rentals.
Boots:	\$4.50/day	
Poles:	\$4/day	
Gloves:	\$1.75/day	

Complete outfit: \$18/day

Lift ticket: \$10/day
\$25/3 days

Enrichment

Ask the students to make up word problems from these expressions.

- $8.64 + (54 - 49)$
- $(6 \times 1.5) + (2 \times 2.3)$
- $(57 + 4.8) - (32 + 16.5)$
- $15 - (8 + 2.5)$

Problem Solving Activities

Assign Level 6, Unit 13

Extra Practice

Worksheet PS14

Pages 308-309

Solve.

- A room measures 5 m \times 6 m. How much will it cost to carpet the room if the carpet costs \$18.75/m²? **\$562.50**
- It costs \$276, \$321, and \$285 to heat the Sherman's home in the three winter months. What is the average monthly cost of heating their home in the winter? **\$294**
- Ms. Tynan is given a car allowance of 16.5¢/km for business trips and a daily meal allowance of \$18. Last week she was out on business for 3 days and travelled 526 km. How much money should she ask for on her expense account? **\$140.79**
- Victor bought a bed at a 15% discount. The original price was \$285. How much did he pay for the bed? **\$242.25**

Unit 13 Objective	Test Questions	Pages
GR5	1-2	290-291
M16	3-5	292-293
N21	6-7	294-295
N22	8-10	296-297
GR6	11-14	298-299
G11	15	302-303
G12	16-17	304-305
G13	18-19	306-307

TEST

UNIT 13

Copy and complete the pattern. State the rule.

- $(0, 3) (1, 4) (2, 5) (3, 6) (\square, \square) (\square, \square) +3$
- $(3, 1) (6, 2) (9, 3) (12, 4) (\square, \square) (\square, \square) \div 3$

Which temperature is lower?

- $+8^\circ\text{C}$ or $+18^\circ\text{C}$
- $+2^\circ\text{C}$ or -1°C
- -10°C or -5°C

Copy. Fill in the missing numbers.

- $\square \quad +5 \quad \square$
 $+4 \quad +6$
- $\square \quad -3 \quad -1 \quad \square$
 $-2 \quad 0$

Copy and complete using $>$ or $<$.

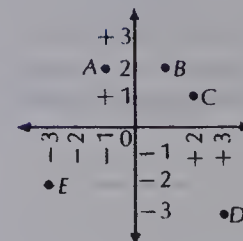
- $+6 \bullet +10$
 $<$
- $+2 \bullet -7$
 $>$
- $-10 \bullet -5$
 $<$

Name the point located by the ordered pair.

- $(+3, -3)$
D
- $(-1, +2)$
A

Write the ordered pair for each.

- C $(+2, +1)$
- E $(-3, -2)$




15. Which figures would tile a surface?

- Yes  No  No 

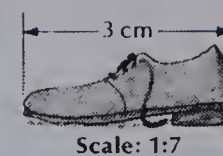
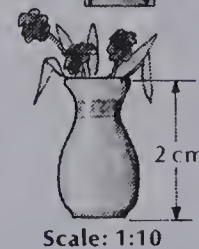
Which angles are equal in the similar figures?

- 
A-X
B-Y
C-Z

- 
P-W
Q-T
R-U
S-V

Solve.

- How tall is the real vase?
20 cm
- How long is the real shoe?
21 cm



310

Post-test

Unit 13

Complete the pattern. State the rule.

- $(1, 1) (2, 4) (3, 9) (4, 16) (5, 25) (6, 36)$
- $(0, 0) (1, 9) (2, 18) (3, 27) (4, 36) (5, 45)$

Which temperature is higher?

- $+4^\circ\text{C}$ or -8°C
- 0°C or $+1^\circ\text{C}$
- -2°C or -10°C



Complete the pattern.


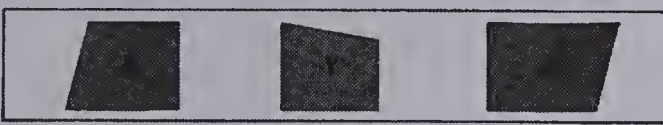
- $-5, -4, -3, -2, -1, 0$
- $+4, +3, +2, +1, 0, -1$

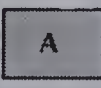

Complete using $<$ or $>$.



- $-5 < -2$
- $+3 > +1$
- $-7 < 0$

Find the figure congruent to A.

1.  \times 

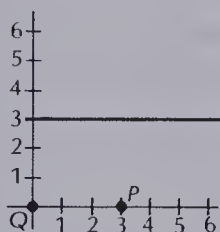
2.  \neq 

3.  \neq 

4.  \neq 

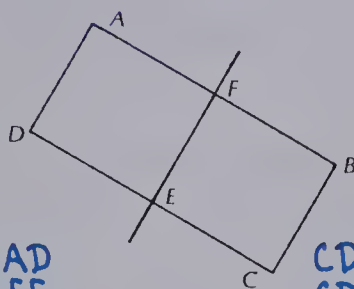
Name the coordinates of the image of point P.

5. After a slide of 3 right and up 5. $(6, 5)$
6. After a flip over the line. $(3, 6)$
7. After a quarter turn counterclockwise about Q. $(0, -3)$



In the figure to the right:

8. name all the parallel segments.
9. name all the perpendicular segments.



$AB \parallel CD$ $AD \parallel BC$ $AB \perp AD$ $CD \perp AD$
 $AD \parallel EF$ $BC \parallel EF$ $AB \perp EF$ $CD \perp EF$
 $AB \perp BC$ $CD \perp BC$

311

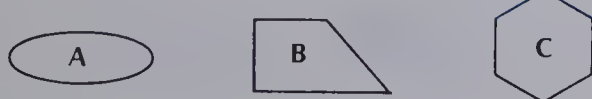
Name the point located by the ordered pair.

11. $(-4, 0)$ **A** 12. $(-2, -3)$ **F**

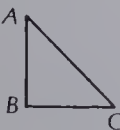
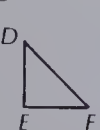
Write the ordered pair for each.

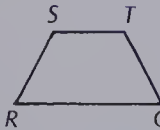
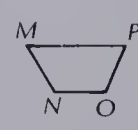
13. **B** $(+1, +2)$ 14. **D** $(-1, -1)$

15. Which figures would tile a surface? **B, C**



Name the congruent angles in the similar figures.

16.   **A-D**
B-E
C-F

17.  

Complete.

	Scale	Drawing	Real Object
18.	1:8	14 cm	112 cm
19.	1:12	25 cm	300 cm

S-O
T-N
Q-M
R-P

UNIT 14

Addition and Subtraction of Fractions

Theme: Food

Lesson	Objective		Pages
Preview		Review equivalent fractions.	313
1	A61	Add fractions with the same denominators, regrouping and/or simplifying the sum.	314-315
2	A62	Add fractions with different denominators, with one denominator being a multiple of the other.	316-317
3	A63	Add fractions with different denominators.	318-319
4	A64	Add mixed numerals by regrouping the sum.	320-321
5	A65	Subtract fractions with different denominators, with one denominator a multiple of the other.	322-323
6	A66	Subtract fractions with different denominators.	324-325
7	A67	Subtract mixed numerals without regrouping the minuend.	326-327
8	A68	Subtract mixed numerals by regrouping the minuend.	328-329
9	A69	Determine probability.	330-331
10	PS15	Use diagrams and models to solve problems.	332-333
Test		Addition and subtraction of fractions	334
Review		Graphs	335

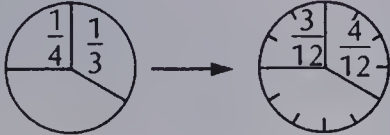
About This Unit

Although there is less emphasis on the use of fractions because of the metric system and the prevalence of calculators, there is still extensive use of fractions in everyday life and in higher mathematics. We still use quarter and half notes in music, "quarter after two" for telling time, and "quarter" for 25¢. Higher mathematics is heavily dependent on fraction concepts and operations. Consequently, the work of this unit has practical uses in everyday life and lays important foundations for future work in mathematics.

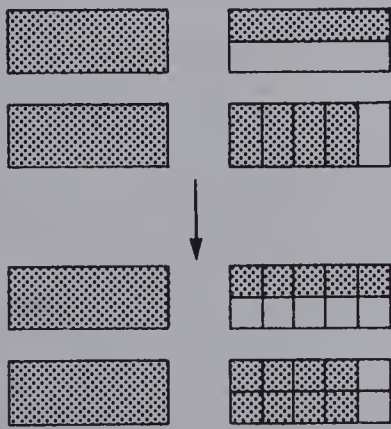
Unit 14 extends fraction concepts developed earlier in Units 7 and 8. This unit takes a close look at the addition and subtraction of fractions. For the first time in the *Houghton Mifflin Mathematics Program*, students must regroup minuends in order to subtract. Students are also frequently required to regroup and/or simplify results.

Emphasis is placed on the use of illustrations to model the addition and subtraction situations. Students then can better visualize the computation.

Adding with different denominators.

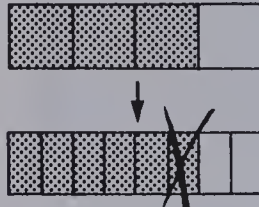
1. 

$$\frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$$

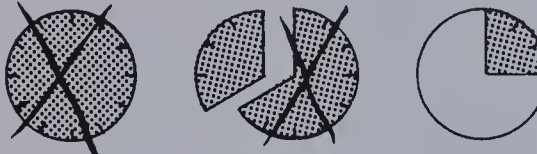
2. 

$$\begin{array}{r} 1\frac{1}{2} \\ + 1\frac{4}{5} \\ \hline 1\frac{5}{10} \\ + 1\frac{8}{10} \\ \hline 2\frac{13}{10} = 3\frac{3}{10} \end{array}$$

Subtracting with different denominators.

1. 

$$\frac{3}{4} - \frac{1}{8} = \frac{6}{8} - \frac{1}{8} = \frac{5}{8}$$

2. 


$$2\frac{1}{4} - 1\frac{2}{3} = \frac{7}{12}$$

Lesson 9 develops probability concepts. The activity-oriented lesson is meant to help the students understand the meaning and usefulness of probability in a "hands-on" manner. An understanding of equivalent fractions is necessary for success with this lesson.

Lesson 10 shows the students the usefulness of diagrams and models in problem-solving situations.

Ideas

The fraction concepts of this end-of-the-year unit can be linked with previously learned decimal and percent concepts.

1. 

$$\frac{1}{4} + \frac{1}{2} = \frac{3}{4} \quad 0.25 + 0.50 = 0.75 \quad 25\% + 50\% = 75\%$$

2.
$$\begin{array}{r} 1\frac{3}{4} \\ + 2\frac{1}{2} \\ \hline 4\frac{1}{4} \end{array} \quad \text{or} \quad \begin{array}{r} 1.75 \\ + 2.50 \\ \hline 4.25 \end{array} \quad \text{or} \quad \begin{array}{r} 175\% \\ + 250\% \\ \hline 425\% \end{array}$$

3.
$$\begin{array}{r} 1\frac{1}{2} \\ - \frac{5}{8} \\ \hline \frac{7}{8} \end{array} \quad \text{or} \quad \begin{array}{r} 1.500 \\ - 0.625 \\ \hline 0.875 \end{array} \quad \text{or} \quad \begin{array}{r} 150.0\% \\ - 62.5\% \\ \hline 87.5\% \end{array}$$

UNIT 14

ADDITION & SUBTRACTION OF FRACTIONS



Unit 14 Objectives	Test Questions	Pages
A61	1-3	314-315
A62	4-7	316-317
A63	8-11	318-319
A64	12-15	320-321
A65	16-18	322-323
A66	19-21	324-325
A67	22-25	326-327
A68	26-30	328-329
A69	31-34	330-331

Pretest

Unit 14

Add or subtract. Write the answer in simplest terms.

1. $\frac{4}{11} + \frac{3}{11} = \frac{7}{11}$
2. $\frac{4}{5} + \frac{3}{5} = 1\frac{2}{5}$
3. $\frac{5}{8} + \frac{5}{8} = 1\frac{1}{4}$
4. $\frac{1}{3} + \frac{5}{9} = \frac{8}{9}$
5. $\frac{5}{12} + \frac{1}{3} = \frac{3}{4}$
6. $\frac{4}{5} + \frac{8}{15} = 1\frac{1}{3}$
7. $\frac{4}{7} + \frac{3}{14} = \frac{11}{14}$
8. $\frac{5}{6} + \frac{5}{9} = 1\frac{7}{18}$
9. $\frac{3}{8} + \frac{7}{12} = \frac{23}{24}$
10. $\frac{3}{7} + \frac{8}{9} = 1\frac{20}{63}$
11. $\frac{7}{9} + \frac{1}{4} = 1\frac{1}{36}$
12. $2\frac{7}{8} + 5\frac{1}{3} = 8\frac{5}{24}$
13. $2\frac{3}{4} + 7\frac{5}{6} = 10\frac{7}{12}$
14. $1\frac{5}{11} + 1\frac{1}{2} = 2\frac{21}{22}$
15. $3\frac{11}{15} + 1\frac{1}{6} = 4\frac{9}{10}$
16. $\frac{9}{10} - \frac{1}{2} = \frac{2}{5}$
17. $\frac{19}{27} - \frac{5}{9} = \frac{4}{27}$
18. $\frac{17}{30} - \frac{1}{15} = \frac{1}{2}$

Matchmaker

Match the equivalent fractions from the three columns.
The letters of each set spell a name.

A

B

E

J

K

L

M

P

R

T

E

A

N

I

O

E

O

V

A

O

4/10

2/3

3/9

1/5

2/2

2/12

3/12

15/18

9/12

1/2

A

B

D

E

G

M

N

T

U

Y

10/12

10/20

6/15

11/11

3/18

2/10

2/6

6/9

1/4

3/4

ANN

BOB

EVA

JOE

KIM

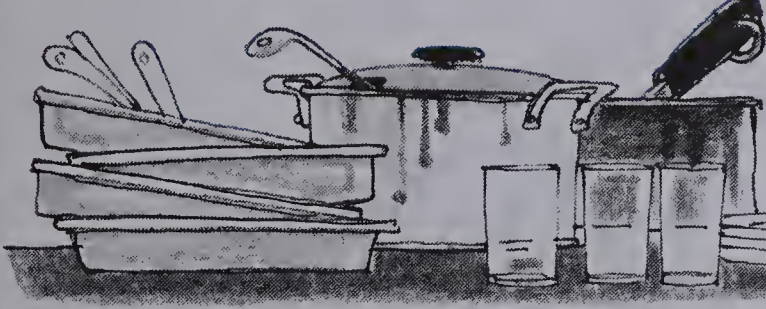
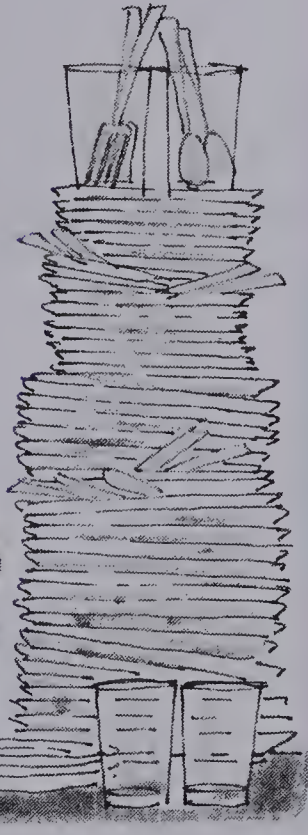
LOU

MEG

PAT

RAY

TED



UNIT 14 PREVIEW

Suggestions

Since the theme of this unit is food, display as many food items as possible for use as fraction models. For example, food models for 5/8 :



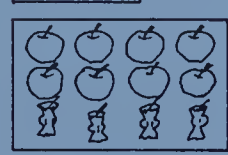
Review the fraction families. For example, use a carton of eggs to show the twelfths: 0/12, 1/12, 2/12, ..., 12/12, 13/12, etc.

About the Page

Use models or chalkboard illustrations to review equivalent fractions (pages 148-151). Recall how equivalent fractions can be generated by multiplying or by dividing the numerator and denominator by the same number.



2/3 = (2 x 2) / (3 x 2) = 4/6



8/12 = (8 ÷ 4) / (12 ÷ 4) = 2/3

Explain the directions at the top of page 313. Point out that one of the three fractions in each set is in simplest terms. Show how this fraction can be used to test the equivalence of the three fractions in the set.

1/3 = 3/9 = 2/6
A N N

1 x 3 / 3 x 3 = 3/9 1 x 2 / 3 x 2 = 2/6

Reinforcement

1. Write each of the fractions on page 313 on an index card. Use them for a card game with rules similar to "Rummy".

2. Ask the students to continue the equivalent fraction patterns.

a. 1/2 = 2/4 = 3/6 = □, □, □, ...

b. 3/5 = 6/10 = 9/15 = □, □, □, ...

c. 4/7 = 8/14 = 12/21 = □, □, □, ...

19. 3/4 - 2/9 = 19/36

20. 5/6 - 4/5 = 1/30

21. 7/8 - 3/20 = 29/40
22. 9 7/10 - 5 4/15 = 4 13/30

23. 4 4/5 - 1 5/9 = 3 11/45

24. 6 8/9 - 2 3/4 = 4 5/36
25. 11 5/6 - 8 3/4 = 3 1/12

26. 7 1/10 - 2 2/5 = 4 7/10

27. 6 1/8 - 2 1/2 = 3 5/8
28. 8 3/16 - 2 3/4 = 5 7/16

29. 5 1/7 - 2 7/9 = 2 23/63

30. 4 1/3 - 1 5/8 = 2 17/24

What is the probability of rolling:

31. a 3? 1/6



32. an even number? 1/2

33. a 7? 0

34. a number less than 5? 2/3

Objective A61

Add fractions with the same denominators, regrouping and/or simplifying the sum.

Introducing the Lesson

Three important, previously-learned fraction skills should be reviewed before starting this lesson.

Simplifying fractions

Ask the students to divide the numerator and denominator by the same number to simplify these fractions.

$$\frac{8}{14} \quad \frac{6}{15} \quad \frac{10}{12} \quad \frac{15}{24}$$

Regrouping fractions as mixed numerals

Use illustrations and division to show how fractions can be regrouped as mixed numerals as explained on page 156.

Adding fractions which do not require regrouping or simplifying of the sum

$$\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$$

Teaching the Lesson

Use chalkboard illustrations as you explain the three types of addition of fraction problems encountered in this lesson. Provide practice with several examples of each type.

Sums requiring simplifying

$$\frac{2}{6} + \frac{2}{6} = \frac{4}{6} \text{ or } \frac{2}{3}$$



Discuss the lesson example on page 314.

Sums requiring regrouping

$$\frac{4}{5} + \frac{3}{5} = \frac{7}{5} \text{ or } 1\frac{2}{5}$$

$$\frac{7}{5} = 5 \overline{)7} \text{ or } 1\frac{2}{5}$$

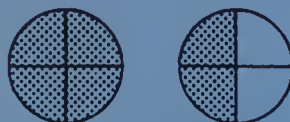
Sums requiring regrouping and simplifying

$$\frac{3}{4} + \frac{3}{4} = \frac{6}{4}$$

$$\text{Regroup: } \frac{6}{4} = 1\frac{2}{4}$$

$$\text{Simplify: } 1\frac{2}{4} = 1\frac{1}{2}$$

$$\text{Thus, } \frac{3}{4} + \frac{3}{4} = 1\frac{1}{2}$$



Adding Fractions

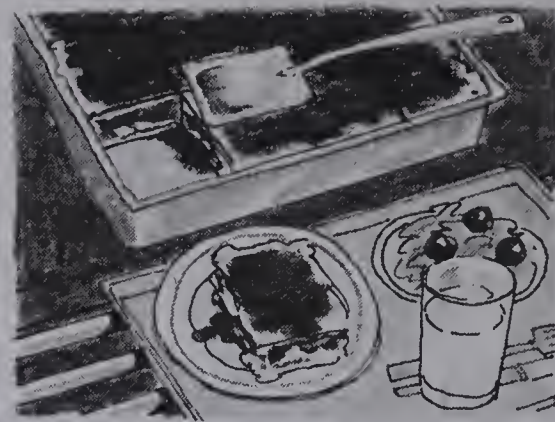
In the school cafeteria, Mrs. Kates cut each pan of lasagna into 24 pieces. She served 8 pieces to the first group of students and 10 pieces to the next group. What fraction of the first pan of lasagna was served?

$$\frac{8}{24} + \frac{10}{24} = \frac{18}{24}$$

But $\frac{18}{24}$ can be written in simpler terms.

$$\frac{18}{24} = \frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

$\frac{3}{4}$ of the first pan of lasagna was served.



EXERCISES

Add.

1. 1 fourth + 2 fourths = $\frac{3}{4}$ fourths
2. 3 fifths + 1 fifth = $\frac{4}{5}$ fifths
3. 2 eights + 5 eights = $\frac{7}{4}$ eights

Add. Write the sum in simplest terms.

4. $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
5. $\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$
6. $\frac{3}{8} + \frac{4}{8} = \frac{7}{8}$
7. $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$
8. $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$
9. $\frac{3}{8} + \frac{1}{8} = \frac{1}{2}$
10. $\frac{1}{6} + \frac{1}{6} = \frac{1}{3}$
11. $\frac{3}{10} + \frac{1}{10} = \frac{2}{5}$
12. $\frac{4}{5} + \frac{1}{5} = 1$
13. $\frac{5}{8} + \frac{4}{8} = 1\frac{1}{8}$
14. $\frac{5}{6} + \frac{4}{6} = 1\frac{1}{2}$
15. $\frac{3}{4} + \frac{3}{4} = 1\frac{1}{2}$
16. $\frac{2}{18} + \frac{4}{18} = \frac{1}{3}$
17. $\frac{5}{12} + \frac{7}{12} = 1$
18. $\frac{11}{15} + \frac{9}{15} = 1\frac{1}{3}$
19. $\frac{11}{20} + \frac{4}{20} = 1\frac{3}{4}$
20. $\frac{5}{24} + \frac{7}{24} = 1\frac{1}{2}$
21. $\frac{20}{25} + \frac{10}{25} = 1\frac{1}{5}$
22. $\frac{1}{50} + \frac{4}{50} = \frac{1}{10}$
23. $\frac{8}{100} + \frac{2}{100} = \frac{1}{10}$

Using the Exercises

- Questions 1 to 3 reinforce the concept that only the numerators are added.
- Questions 4 to 7 do not require any regrouping or simplifying of the sums.
- Questions 8 to 11 require the sums to be simplified.
- Questions 12 to 23 require regrouping and/or simplifying of the sums. The last four problems of this type are written vertically.

PRACTICE

Add. Write the sum in simplest terms.

1. $\frac{3}{8} + \frac{4}{8} = \frac{7}{8}$
2. $\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$
3. $\frac{2}{6} + \frac{4}{6} = 1$
4. $\frac{6}{10} + \frac{2}{10} = \frac{4}{5}$
5. $\frac{7}{12} + \frac{2}{12} = \frac{3}{4}$
6. $\frac{6}{10} + \frac{2}{10} = \frac{4}{5}$
7. $\frac{7}{10} + \frac{3}{10} = 1$
8. $\frac{8}{10} + \frac{4}{10} = 1\frac{1}{5}$
9. $\frac{9}{10} + \frac{6}{10} = 1\frac{1}{2}$
10. $\frac{8}{10} + \frac{9}{10} = 1\frac{7}{10}$
11. $\frac{3}{12} + \frac{3}{12} = \frac{1}{2}$
12. $\frac{8}{25} + \frac{7}{25} = \frac{3}{5}$
13. $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$
14. $\frac{3}{5} + \frac{3}{5} = 1\frac{1}{5}$
15. $\frac{4}{8} + \frac{6}{8} = 1\frac{1}{2}$
16. $\frac{13}{20} + \frac{12}{20} = 1\frac{1}{4}$

Solve.

17. Twenty students in Room 106 stayed for lunch. Eight of them ate red apples and six of them ate yellow apples. What fraction of the students ate apples for lunch? $\frac{7}{10}$
18. Mr. Lawes hard boiled a dozen eggs. Ben ate 2 and Anna ate 1.
 - a. What fraction of the eggs did Ben and Anna eat? $\frac{1}{4}$
 - b. What fraction of the eggs is left? $\frac{3}{4}$

Fraction Patterns

Continue each fraction pattern for 3 more steps.

1. $\frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \frac{4}{10}, \dots, \frac{5}{10}, \frac{6}{10}, \frac{7}{10}$
2. $\frac{1}{12}, \frac{3}{12}, \frac{5}{12}, \frac{7}{12}, \dots, \frac{9}{12}, \frac{11}{12}, \frac{13}{12}$
3. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \dots, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}$
4. $\frac{1}{2}, 1, 1\frac{1}{2}, 2, \dots, 2\frac{1}{2}, 3, 3\frac{1}{2}$
5. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \dots, \frac{5}{6}, \frac{6}{7}, \frac{7}{8}$
6. $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \dots, \frac{1}{32}, \frac{1}{64}, \frac{1}{128}$



315

Assigning the Practice

Minimum: 1-16

Average: 1-17

Enriched: 1-18

Reinforcement

1. Have the students complete these addition tables.

a.

+	$\frac{1}{10}$	$\frac{4}{10}$	$\frac{5}{10}$	$\frac{7}{10}$	$\frac{9}{10}$
$\frac{6}{10}$					

b.

+	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{4}{8}$	$\frac{7}{8}$	$\frac{8}{8}$
$\frac{5}{8}$					

c.

+	$\frac{3}{20}$	$\frac{9}{20}$	$\frac{11}{20}$	$\frac{14}{20}$	$\frac{19}{20}$
$\frac{13}{20}$					

2. Ask the students to write an addition for each illustration.

a. +

b. +

c. +

d. +

Enrichment

1. Assign *Fraction Patterns* at the bottom of page 315.

2. Challenge the students with the following problems.

a. Write one as a sum of two and three fractions. (For example, $1 = \frac{1}{3} + \frac{2}{3}$ or $1 = \frac{1}{2} + \frac{1}{4} + \frac{1}{4}$.)

b. Write $\frac{7}{8}$ as a sum of three fractions. (For example, $\frac{7}{8} = \frac{3}{8} + \frac{2}{8} + \frac{2}{8}$.)

c. Write $1\frac{1}{2}$ as a sum of three or more fractions. (For example, $1\frac{1}{2} = \frac{1}{2} + \frac{1}{2} + \frac{1}{4} + \frac{1}{4}$.)

Extra Practice

Add. Write the sum in simplest terms.

1. + $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
2. + $\frac{2}{5} + \frac{4}{5} = 1\frac{1}{5}$
3. + $\frac{6}{8} + \frac{4}{8} = 1\frac{1}{4}$
4. + $\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$
5. + $\frac{5}{9} + \frac{2}{9} = \frac{7}{9}$
6. + $\frac{6}{10} + \frac{5}{10} = 1\frac{1}{10}$
7. + $\frac{8}{12} + \frac{8}{12} = 1\frac{1}{3}$
8. + $\frac{4}{7} + \frac{8}{7} = 1\frac{5}{7}$
9. + $\frac{4}{5} + \frac{1}{5} = 1$
10. + $\frac{9}{12} + \frac{7}{12} = 1\frac{1}{3}$
11. + $\frac{14}{15} + \frac{6}{15} = 1\frac{1}{3}$
12. + $\frac{16}{20} + \frac{8}{20} = 1\frac{1}{5}$

13. At breakfast, $\frac{5}{12}$ of a loaf of bread was eaten. At lunch, $\frac{6}{12}$ of the loaf was eaten. How much of the loaf was eaten altogether? $\frac{11}{12}$

Worksheet A61

Pages 314-315

Objective A62

Add fractions with different denominators, with one denominator being a multiple of the other.

Introducing the Lesson

Review **multiples** by asking the students to name the multiples of 3, 4, 5, 6, 8, etc. Ask questions such as: "Is 8 a multiple of 2?" "Is 18 a multiple of 4?"

Review the addition of fractions procedure learned so far by pointing out how the denominators must be the same in order to add. Use examples similar to these.

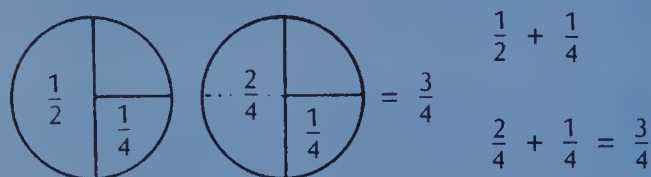
$$\frac{1}{6} + \frac{3}{6} \quad \frac{7}{8} + \frac{7}{8} \quad \frac{8}{12} + \frac{10}{12}$$

Review the renaming of fractions.

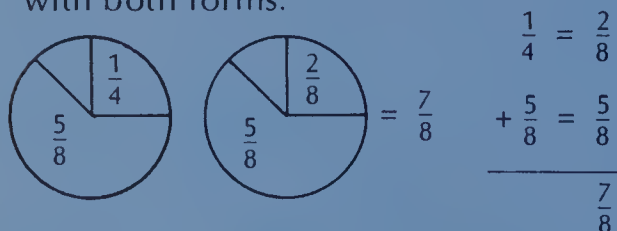
$$\frac{3}{4} = \frac{?}{8} \quad \frac{1}{6} = \frac{?}{18} \quad \frac{4}{5} = \frac{?}{20}$$

Teaching the Lesson

Sketch the remainders of two pizzas on the chalkboard: $\frac{1}{2}$ of one, and $\frac{1}{4}$ of another. Combine the two remaining pieces and ask, "How much pizza is left in all?" Point out that since 4 is a multiple of 2, $\frac{1}{2}$ can be renamed as $\frac{2}{4}$ to make the addition easier.

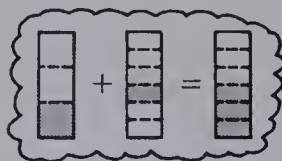


Sketch pizza pieces to suit the following example. Explain how $\frac{1}{4}$ can be renamed as $\frac{2}{8}$ since 8 is a multiple of 4. Show the addition using the vertical format so the students are familiar with both forms.



Read and discuss the addition at the top of page 316. Note that the sum, $\frac{3}{6}$, was simplified to $\frac{1}{2}$. Provide practice with other similar addition problems.

Different Denominators



You can add $\frac{1}{3}$ and $\frac{1}{6}$ even though the denominators are different.

Rewrite a fraction so the denominators are the same.

Add.

Simplify.



$$\frac{1}{3} + \frac{1}{6}$$

$$\frac{2}{6} + \frac{1}{6}$$

$$\frac{2}{6} + \frac{1}{6} = \frac{3}{6}$$

$$\frac{3}{6} = \frac{1}{2}$$

$$\text{So, } \frac{1}{3} + \frac{1}{6} = \frac{1}{2}$$

6 is a common denominator for $\frac{1}{3}$ and $\frac{1}{6}$.

EXERCISES

Copy and complete.

$$1. \quad \frac{1}{2} + \frac{3}{8}$$

$$\frac{4}{8} + \frac{3}{8} = \frac{7}{8}$$

$$2. \quad \frac{3}{10} + \frac{2}{5}$$

$$\frac{3}{10} + \frac{4}{10} = \frac{7}{10}$$

$$3. \quad \frac{1}{12} + \frac{2}{3}$$

$$\frac{1}{12} + \frac{8}{12} = \frac{9}{12}$$

Add. Write the sum in simplest terms.

$$4. \quad \frac{1}{8} + \frac{1}{4} = \frac{3}{8}$$

$$5. \quad \frac{2}{3} + \frac{1}{6} = \frac{5}{6}$$

$$6. \quad \frac{3}{5} + \frac{1}{10} = \frac{7}{10}$$

$$7. \quad \frac{1}{4} + \frac{3}{8} = \frac{5}{8}$$

$$8. \quad \frac{2}{9} + \frac{1}{3} = \frac{5}{9}$$

$$9. \quad \frac{1}{2} + \frac{2}{8} = \frac{3}{4}$$

$$10. \quad \frac{1}{12} + \frac{1}{4} = \frac{1}{3}$$

$$11. \quad \frac{1}{2} + \frac{3}{10} = \frac{8}{5}$$

$$12. \quad \frac{2}{5} + \frac{7}{10} = 1\frac{1}{10}$$

$$13. \quad \frac{1}{6} + \frac{5}{12} = \frac{7}{12}$$

$$14. \quad \frac{7}{8} + \frac{3}{4} = 1\frac{5}{8}$$

$$15. \quad \frac{9}{10} + \frac{2}{5} = 1\frac{3}{10}$$

$$16. \quad \frac{3}{4} + \frac{1}{2} = 1\frac{1}{4}$$

$$17. \quad \frac{3}{8} + \frac{2}{16} = \frac{1}{2}$$

$$18. \quad \frac{1}{3} + \frac{4}{6} = 1$$

$$19. \quad \frac{2}{7} + \frac{6}{14} = \frac{5}{7}$$

$$20. \quad \frac{6}{10} + \frac{1}{5} = \frac{4}{5}$$

316

Using the Exercises

- Questions 1 to 3 help the students get started with the vertical format for the addition of fractions with unlike denominators.
- Work a few of the horizontal and vertical questions from 4 to 11 together and discuss the choosing of the common denominator and the renaming of one fraction addend. None of these additions require regrouping or simplifying of the sums.
- Questions 12, 14, 15, and 16 require that the sums be regrouped as mixed numerals. Work a few of these together.
- Questions 17 to 20 require that the sums be written in simplest terms.

PRACTICE

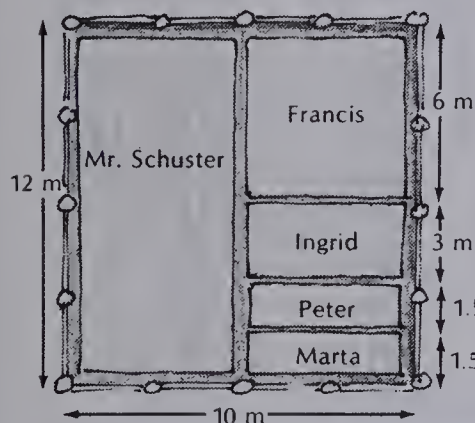
Add. Simplify the sum.

1. $\frac{3}{5} + \frac{3}{10} = \frac{9}{10}$
2. $\frac{7}{8} + \frac{3}{4} = 1\frac{5}{8}$
3. $\frac{1}{3} + \frac{4}{9} = \frac{7}{9}$
4. $\frac{5}{6} + \frac{2}{3} = 1\frac{1}{2}$
5. $\frac{5}{12} + \frac{2}{3} = 1\frac{1}{2}$
6. $\frac{3}{4} + \frac{1}{12} = \frac{7}{12}$
7. $\frac{2}{3} + \frac{5}{9} = 1\frac{7}{9}$
8. $\frac{1}{9} + \frac{2}{3} = \frac{7}{9}$
9. $\frac{7}{8} + \frac{1}{2} = 1\frac{3}{8}$
10. $\frac{4}{5} + \frac{1}{10} = \frac{9}{10}$
11. $\frac{3}{10} + \frac{1}{2} = \frac{4}{5}$
12. $\frac{1}{12} + \frac{3}{4} = \frac{5}{6}$
13. $\frac{7}{10} + \frac{4}{5} = 1\frac{1}{2}$
14. $\frac{3}{12} + \frac{1}{3} = \frac{7}{12}$
15. $\frac{7}{12} + \frac{2}{3} = 1\frac{1}{4}$
16. $\frac{7}{20} + \frac{1}{10} = \frac{9}{20}$
17. $\frac{3}{25} + \frac{2}{5} = \frac{13}{25}$

Solve.

18. The Actons estimated that they used $\frac{1}{4}$ of a box of cereal one week and $\frac{1}{2}$ the next. About how much of the box of cereal was gone? $\frac{3}{4}$
19. Nina has \$1.50 for lunch money. She spent 50¢ for a sandwich and 25¢ for milk. What fraction of her lunch money did she spend for the sandwich? $\frac{1}{3}$ for the milk? $\frac{1}{6}$ for the sandwich and milk together? $\frac{1}{2}$

Garden Patches



- a. Mr. Schuster tends $\frac{1}{2}$ of the garden. What fraction does Francis tend? $\frac{1}{4}$ Ingrid? $\frac{1}{8}$ Peter? $\frac{1}{16}$ Marta? $\frac{1}{16}$
- b. What fraction of the garden do Francis and Ingrid tend together? $\frac{3}{8}$
- c. What fraction of the garden do Francis, Ingrid, and Peter tend together? $\frac{7}{16}$
- d. What fraction of the garden do Mr. Schuster, Peter, and Marta tend together? $\frac{5}{8}$

317

Extra Practice

Add. Write the sum in simplest terms.

1. $\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$
2. $\frac{2}{6} + \frac{1}{3} = \frac{2}{3}$
3. $\frac{3}{4} + \frac{1}{8} = \frac{7}{8}$
4. $\frac{3}{5} + \frac{1}{10} = \frac{7}{10}$
5. $\frac{3}{10} + \frac{7}{20} = \frac{13}{20}$
6. $\frac{5}{6} + \frac{7}{12} = 1\frac{5}{12}$
7. $\frac{9}{11} + \frac{8}{22} = 1\frac{1}{11}$
8. $\frac{4}{5} + \frac{6}{15} = 1\frac{2}{5}$
9. $\frac{3}{9} + \frac{15}{18} = 1\frac{1}{6}$
10. Five eighths of the cost of a hamburger made at home is for meat. One fourth of the cost is for the bun. What part is left for the catsup, mustard, and relish? $\frac{1}{8}$

Worksheet A62

Pages 316-317

Assigning the Practice

Minimum: 1-18

Average: 1-18

Enriched: 1-19

Reinforcement

1. Ask the students to rename the following fractions by altering the illustration and by using the equivalent fraction method. For example, rename $\frac{1}{2}$ as fourths:

$$\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$$

- a. Rename as eighths



- b. Rename as twelfths



2. Provide practice with illustrated additions similar to the following. Use the illustrations to explain the reasonableness of the sums.

- a. $\frac{1}{6} + \frac{5}{12} = ?$

- b. $\frac{1}{4} + \frac{1}{8} = ?$

- c. $\frac{5}{6} + \frac{2}{3} = ?$

Enrichment

1. Assign *Garden Patches* at the bottom of page 317.
2. Have the students find the missing numbers.
 - a. $\frac{\square}{4} + \frac{3}{8} = \frac{5}{8}$
 - b. $\frac{\square}{5} + \frac{7}{10} = \frac{7}{10}$
 - c. $\frac{3}{4} + \frac{\square}{8} = \frac{7}{8}$
 - d. $\frac{1}{4} + \frac{\square}{8} = \frac{1}{2}$

UNIT 14 LESSON 3

Objective A63

Add fractions with different denominators.

Introducing the Lesson

Review the meaning of least common multiple (LCM) as explained on pages 122-123. Have the students find the LCM for: 2 and 3, 2 and 5, 3 and 5, and 4 and 6.

Explain that the LCM is used as the LCD (least common denominator) when adding (or subtracting) fractions.

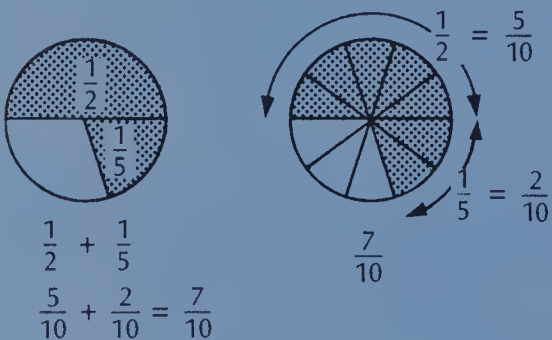
Teaching the Lesson

Recall that there must be common denominators for the addition of fractions. Review the addition of, e.g.,

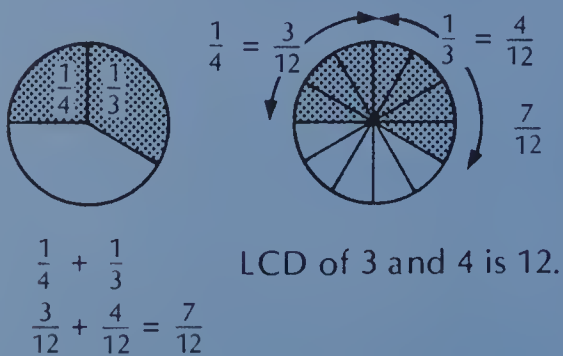
$\frac{3}{4}$ and $\frac{1}{2}$. Explain how $\frac{1}{2}$ is renamed as $\frac{2}{4}$ because 4 is a multiple of 2.

Point out and discuss the problem at the top of page 318. Note that 5 is not a multiple of 2 so $\frac{1}{2}$ cannot be renamed

in fifths. Explain that both fractions can be renamed in tenths since 10 is the LCD of 2 and 5. Use an illustration to show the reasonableness of the sum.



Explain also the addition of other similar fractions. Use illustrations to model the situation.



Point out that the sums of these kinds of additions also can require regrouping and simplifying.

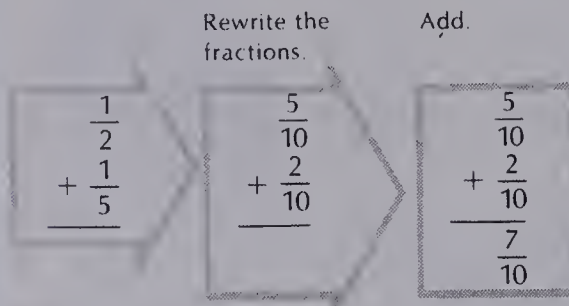
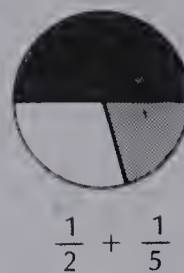
Different Denominators

Sometimes both fractions must be rewritten before they can be added. Find the **least common denominator**.

multiples of 2: 2, 4, 6, 8, 10

multiples of 5: 5, 10

10 is the least common denominator (LCD).



Then simplify the answer if possible.

EXERCISES

Find the least common multiple of each pair of numbers.

1. 4, 8 **8**
2. 3, 9 **9**
3. 2, 6 **6**
4. 4, 12 **12**
5. 6, 9 **18**
6. 4, 6 **12**
7. 6, 8 **24**
8. 4, 5 **20**
9. 2, 10 **10**
10. 5, 6 **30**
11. 3, 5 **15**
12. 10, 12 **60**

Copy and complete.

13. $\frac{1}{3} + \frac{2}{5} = \frac{5}{15} + \frac{6}{15} = \frac{11}{15}$
14. $\frac{3}{4} + \frac{1}{6} = \frac{9}{12} + \frac{2}{12} = \frac{11}{12}$
15. $\frac{2}{5} + \frac{1}{4} = \frac{8}{20} + \frac{5}{20} = \frac{13}{20}$

Add. Write the sum in simplest terms.

16. $\frac{1}{2} + \frac{3}{7} = \frac{7}{14} + \frac{6}{14} = \frac{13}{14}$
17. $\frac{3}{8} + \frac{1}{6} = \frac{9}{24} + \frac{4}{24} = \frac{13}{24}$
18. $\frac{1}{6} + \frac{1}{2} = \frac{1}{6} + \frac{3}{6} = \frac{2}{3}$
19. $\frac{1}{3} + \frac{3}{8} = \frac{8}{24} + \frac{9}{24} = \frac{17}{24}$
20. $\frac{3}{10} + \frac{2}{5} = \frac{3}{10} + \frac{4}{10} = \frac{7}{10}$
21. $\frac{2}{3} + \frac{1}{4} = \frac{8}{12} + \frac{3}{12} = \frac{11}{12}$
22. $\frac{1}{6} + \frac{4}{5} = \frac{5}{30} + \frac{24}{30} = \frac{29}{30}$
23. $\frac{3}{4} + \frac{3}{10} = \frac{15}{20} + \frac{6}{20} = \frac{21}{20} = 1\frac{1}{20}$
24. $\frac{1}{2} + \frac{7}{10} = \frac{5}{10} + \frac{7}{10} = 1\frac{1}{5}$

318

Using the Exercises

- Questions 1 to 12 review the skill of finding the LCM. Stress that this is the same as finding the LCD for adding (or subtracting) fractions.
- Questions 13 to 15 help the students get started with choosing the LCD and renaming the fractions so they can be added.
- Questions 16 to 20 require no regrouping and/or simplifying of the sums.
- Questions 21 to 24 are in the horizontal format. The last two need regrouping and simplifying.

PRACTICE

Add. Write the sum in simplest terms.

1. $\frac{3}{8} + \frac{1}{6} = \frac{13}{24}$
2. $\frac{1}{5} + \frac{2}{3} = \frac{13}{15}$
3. $\frac{3}{7} + \frac{1}{2} = \frac{13}{14}$
4. $\frac{1}{6} + \frac{2}{5} = \frac{17}{30}$
5. $\frac{5}{6} + \frac{1}{8} = \frac{22}{24}$
6. $\frac{3}{8} + \frac{2}{3} = 1\frac{1}{24}$
7. $\frac{7}{10} + \frac{1}{6} = \frac{13}{15}$
8. $\frac{3}{8} + \frac{5}{6} = 1\frac{5}{24}$
9. $\frac{4}{9} + \frac{1}{4} = \frac{25}{36}$
10. $\frac{3}{8} + \frac{1}{12} = \frac{11}{24}$
11. $\frac{7}{8} + \frac{2}{3} = 1\frac{13}{24}$
12. $\frac{5}{9} + \frac{1}{6} = \frac{13}{18}$

Solve.

13. Ellen and her friends ordered two large pizzas. After they finished eating, $\frac{1}{4}$ of one pizza and $\frac{1}{6}$ of the other were left. How much pizza was left? $\frac{5}{12}$
14. Vigo has a bag of cherries. He wants to keep $\frac{1}{2}$ of the cherries himself and give $\frac{1}{3}$ to his sister and $\frac{1}{6}$ to his brother. Can he do this? Will there be any left over? Yes, none left over.

Working Backwards

Copy and fill in the missing numbers.

- a. $\frac{\square}{4} + \frac{2}{3} = \frac{11}{12}$
- b. $\frac{\square}{5} + \frac{1}{2} = \frac{9}{10}$
- c. $\frac{\square}{6} + \frac{2}{3} = \frac{22}{15}$
- d. $\frac{3}{6} + \frac{\square}{6} = \frac{19}{12}$

319

Assigning the Practice

Minimum: 1-13

Average: 1-13

Enriched: 1-14

Reinforcement

1. Have the students find the LCM of these pairs of numbers.

- a. 2 and 7
- b. 4 and 6
- c. 6 and 9
- d. 8 and 12
- e. 4 and 10
- f. 10 and 15

2. Ask the students to complete these addition puzzles.

a. $+$ \rightarrow

$\frac{2}{3}$	$\frac{1}{4}$	
$\frac{1}{3}$	$\frac{1}{2}$	

b. $+$ \rightarrow

$\frac{1}{2}$	$\frac{2}{5}$	
$\frac{1}{6}$	$\frac{3}{10}$	

3. Solve this problem.

Jim takes $\frac{1}{3}$ of an hour to eat breakfast;
 $\frac{1}{2}$ of an hour to eat lunch;
 $\frac{3}{4}$ of an hour to eat dinner.

What part of an hour is required to eat:

- a. breakfast and lunch?
- b. breakfast and dinner?
- c. lunch and dinner?

Enrichment

1. Assign *Working Backwards* at the bottom of page 319.

2. Challenge the students with additions of three or more addends, e.g.,

$$\frac{1}{4} + \frac{3}{8} + \frac{2}{3} + \frac{5}{6}$$

3. Ask the students to write $\frac{3}{4}$ as the sum of two fractions in as many ways as they can. Repeat by writing $\frac{3}{4}$ as the sum of three fractions.

Extra Practice

Worksheet A63

Pages 318-319

Add. Write the sum in simplest terms.

1. $\frac{1}{3} + \frac{1}{5} = \frac{8}{15}$
2. $\frac{1}{6} + \frac{1}{4} = \frac{5}{12}$
3. $\frac{3}{8} + \frac{1}{4} = \frac{5}{8}$
4. $\frac{5}{6} + \frac{3}{8} = 1\frac{5}{24}$
5. $\frac{1}{6} + \frac{5}{9} = \frac{13}{18}$
6. $\frac{2}{3} + \frac{1}{8} = \frac{17}{24}$
7. $\frac{3}{4} + \frac{1}{5} = \frac{19}{20}$
8. $\frac{2}{3} + \frac{3}{5} = 1\frac{4}{15}$
9. $\frac{5}{6} + \frac{3}{4} = 1\frac{7}{12}$

Objective A64

Add mixed numerals by regrouping the sum.

Introducing the Lesson

Ask the students to regroup the following mixed numerals. Show them how to regroup the fraction first.

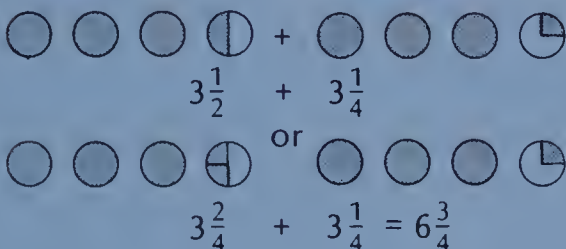
$$6\frac{4}{3} \rightarrow 6 + 1\frac{1}{3} \rightarrow 7\frac{1}{3}$$

a. $5\frac{6}{5}$ b. $4\frac{13}{10}$ c. $1\frac{8}{7}$

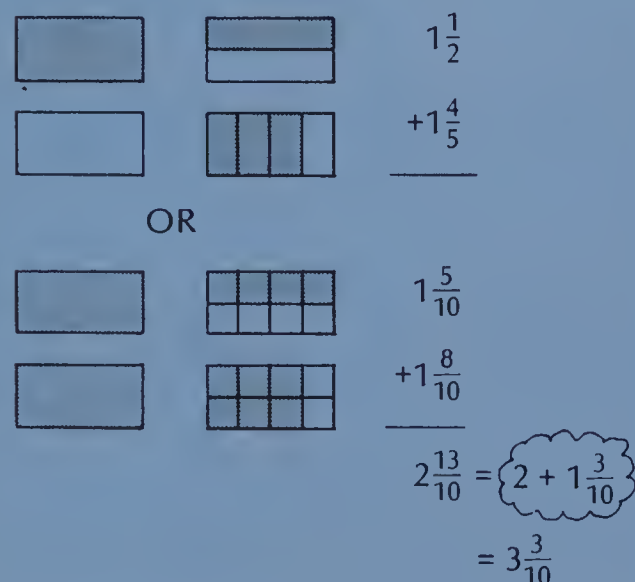
d. $4\frac{11}{6}$ e. $8\frac{5}{2}$ f. $12\frac{7}{4}$

Teaching the Lesson

Read and discuss the first problem at the top of page 320. Point out the LCD, 4. Sketch the following circles on the chalkboard to illustrate the situation.



Now illustrate the following addition on the chalkboard. Discuss the LCD. Note that it is best to add the fractions before the whole numbers. Explain how the sum is regrouped.



Discuss and illustrate the second problem at the top of page 320. Provide practice with several other similar problems. Illustrate all practice problems to show the reasonableness of the sums.

Adding Mixed Numerals

In the cafeteria, Grade 7 needs $3\frac{1}{2}$ tables and Grade 6 needs $3\frac{1}{4}$ tables. How many tables do Grades 6 and 7 need?



Rewrite with the LCD Add.

$$\begin{array}{r}
 3\frac{1}{2} \\
 + 3\frac{1}{4} \\
 \hline
 3\frac{2}{4} \\
 + 3\frac{1}{4} \\
 \hline
 6\frac{3}{4}
 \end{array}$$

Sometimes it is necessary to regroup to simplify the answer.

Rewrite with the LCD Add Regroup

$$\begin{array}{r}
 3\frac{1}{2} \\
 + 2\frac{3}{4} \\
 \hline
 3\frac{2}{4} \\
 + 2\frac{3}{4} \\
 \hline
 5\frac{5}{4}
 \end{array}$$

$\frac{5}{4} = 1\frac{1}{4}$
 $5\frac{5}{4} = 5 + 1\frac{1}{4} = 6\frac{1}{4}$

EXERCISES

Add. Write the answer in simplest terms.

- | | | | | |
|---|--|---|--|--|
| 1. $2\frac{1}{3} + 4\frac{1}{3} = 6\frac{2}{3}$ | 2. $4\frac{3}{8} + 1\frac{1}{8} = 5\frac{4}{8} = 5\frac{1}{2}$ | 3. $10\frac{3}{7} + 8\frac{1}{7} = 18\frac{4}{7}$ | 4. $2\frac{2}{5} + \frac{2}{5} = 2\frac{4}{5}$ | 5. $1\frac{2}{9} + 13\frac{5}{9} = 14\frac{7}{9}$ |
| 6. $1\frac{1}{2} + 2\frac{1}{3} = 3\frac{5}{6}$ | 7. $6\frac{2}{5} + 2\frac{1}{4} = 8\frac{13}{20}$ | 8. $3\frac{1}{4} + 4\frac{1}{2} = 7\frac{3}{4}$ | 9. $6\frac{1}{6} + 5\frac{3}{8} = 11\frac{13}{24}$ | 10. $12\frac{3}{10} + \frac{1}{2} = 12\frac{4}{5}$ |
| 11. $4\frac{3}{4} + 3\frac{2}{3} = 7\frac{5}{12}$ | 12. $5\frac{5}{6} + 1\frac{1}{2} = 7\frac{2}{3}$ | 13. $2\frac{7}{10} + 8\frac{2}{5} = 10\frac{11}{10} = 11\frac{1}{10}$ | 14. $11\frac{1}{2} + 2\frac{5}{8} = 14\frac{1}{8}$ | |

Using the Exercises

- Questions 1 to 5 involve adding mixed numerals with common denominators. Encourage the students to add the fractions before the whole numbers.
- Questions 6 to 10 involve adding mixed numerals whose sums require no regrouping. The sum in question 10 needs to be simplified.
- Questions 11 to 14 use the horizontal format. The sums need to be regrouped and/or simplified.

PRACTICE

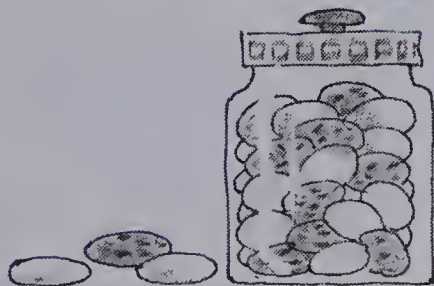
Add. Write the sum in simplest form.

1. $4\frac{2}{5} + 2\frac{1}{2} = 6\frac{9}{10}$
2. $3\frac{2}{7} + 5\frac{3}{7} = 8\frac{5}{7}$
3. $1\frac{1}{4} + 9\frac{5}{6} = 11\frac{11}{12}$
4. $6\frac{2}{5} + 8\frac{7}{10} = 15\frac{1}{10}$
5. $7\frac{2}{9} + 3\frac{1}{4} = 10\frac{17}{36}$
6. $3\frac{1}{2} + \frac{1}{6} = 3\frac{2}{3}$
7. $7\frac{2}{3} + 14\frac{5}{6} = 22\frac{1}{2}$
8. $5\frac{3}{4} + 2\frac{1}{8} = 7\frac{7}{8}$
9. $12\frac{1}{4} + 6\frac{8}{9} = 19\frac{5}{36}$
10. $1\frac{1}{2} + 6\frac{2}{5} = 7\frac{9}{10}$
11. $3\frac{2}{3} + 4\frac{2}{9} = 7\frac{8}{9}$
12. $12\frac{1}{12} + 8\frac{1}{4} = 20\frac{1}{3}$
13. $5\frac{1}{3} + 7\frac{4}{5} = 13\frac{2}{15}$

Solve.

14. Renata baked $4\frac{3}{4}$ dozen cookies and Bill baked $3\frac{2}{3}$ dozen.

- a. How many dozen cookies did they make in all? $8\frac{5}{12}$
- b. How many cookies did they make? 101



REVIEW

Add. Write the sum in simplest terms.

- A61 1. $\frac{5}{6} + \frac{1}{6} = 1$
2. $\frac{2}{3} + \frac{2}{3} = 1\frac{1}{3}$
3. $\frac{3}{10} + \frac{1}{10} = \frac{2}{5}$
- A62 4. $\frac{1}{9} + \frac{1}{3} = \frac{4}{9}$
5. $\frac{5}{12} + \frac{1}{2} = \frac{11}{12}$
6. $\frac{3}{10} + \frac{2}{5} = \frac{7}{10}$
- A63 7. $\frac{2}{3} + \frac{1}{8} = \frac{19}{24}$
8. $\frac{3}{8} + \frac{5}{6} = 1\frac{5}{24}$
9. $\frac{2}{3} + \frac{1}{10} = \frac{23}{30}$
- A64 10. $3\frac{1}{3} + 2\frac{1}{4} = 5\frac{7}{12}$
11. $15\frac{3}{5} + 11\frac{3}{5} = 27\frac{1}{5}$
12. $21\frac{7}{10} + 8\frac{3}{4} = 30\frac{9}{20}$

321

Extra Practice

Add. Write the sum in simplest terms.

1. $1\frac{2}{3} + 1\frac{1}{4} = 2\frac{11}{12}$
2. $1\frac{3}{4} + 1\frac{2}{5} = 3\frac{23}{20}$
3. $3\frac{5}{8} + \frac{3}{4} = 4\frac{11}{8}$
4. $2\frac{1}{5} + 3\frac{3}{4} = 5\frac{17}{20}$
5. $5\frac{2}{9} + 3\frac{1}{4} = 8\frac{17}{36}$
6. $4\frac{1}{6} + 3\frac{3}{4} = 7\frac{11}{12}$
7. $1\frac{1}{2} + 3\frac{1}{3} = 4\frac{5}{6}$
8. $6\frac{1}{4} + 1\frac{1}{3} = 7\frac{7}{12}$
9. $1\frac{2}{3} + 2\frac{2}{5} = 4\frac{14}{15}$
10. For a class party, the boys ate $3\frac{1}{2}$ dozen hot dogs and the girls ate $2\frac{2}{3}$ dozen.
 - a. Altogether, how many dozen were eaten? $6\frac{1}{6}$
 - b. How many hot dogs were eaten in all? 74

Worksheet A64

Pages 320-321

Assigning the Practice

Minimum: 1-13

Average: 1-14

Enriched: 1-14

Review Exercises

Questions	Objective	Pages
1-3	A61	314-315
4-6	A62	316-317
7-9	A63	318-319
10-12	A64	320-321

Reinforcement

1. Ask the students to regroup the following mixed numerals.

- a. $4\frac{8}{5}$
- b. $6\frac{5}{4}$
- c. $9\frac{11}{9}$
- d. $15\frac{7}{2}$
- e. $8\frac{7}{3}$
- f. $12\frac{15}{7}$

2. Provide illustrated problems so the students can study the illustrations, write the mixed numerals with common denominators, and find the sums.

a. $1\frac{1}{3} + 1\frac{1}{4} = 2\frac{7}{12}$

b. $1\frac{2}{5} + 1\frac{2}{3} = 2\frac{14}{15}$

c. $1\frac{1}{4} + 1\frac{1}{5} = 2\frac{6}{20}$

Enrichment

1. Recall how fractions can be changed to decimals through division. Have the students compute the following as fractions and as decimals and then compare the results. Which way is easier to compute?

- a. $\frac{3}{4} + \frac{1}{5}$
- b. $1\frac{1}{2} + \frac{1}{4}$
- c. $2\frac{3}{4} + 3\frac{2}{5}$
- d. $6\frac{7}{10} + 4\frac{1}{2}$

2. George took $2\frac{3}{4}$ h to mow lawns on Saturday and $3\frac{1}{2}$ h on Sunday. How many hours was that in all? minutes?

Objective A65

Subtract fractions with different denominators, with one denominator a multiple of the other.

Introducing the Lesson

Give each student several paper strips. Ask them to take one strip and to fold it into quarters. Then they should label each quarter and shade in $\frac{3}{4}$.



Use this strip to illustrate the subtraction $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$ or $\frac{1}{2}$, as the

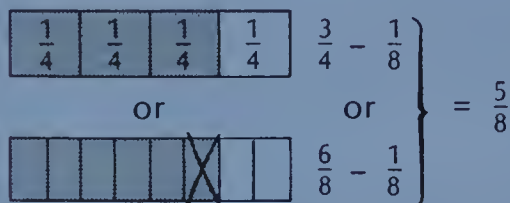
students cross out one quarter. Repeat, with other examples. The students should conclude that if the denominators are alike, the numerators can be subtracted to find the difference between two fractions.

Teaching the Lesson

Use the paper strips to illustrate $\frac{3}{4} - \frac{1}{8}$.

Have the students fold and shade a strip showing $\frac{3}{4}$. Since eighths cannot be taken away from fourths, discuss the need for a common denominator.

Have the students decide to rename $\frac{3}{4}$ as $\frac{6}{8}$ and refold the paper strip into eighths. Then $\frac{1}{8}$ can be crossed out leaving $\frac{5}{8}$.



Provide practice with several other subtractions using the paper strips. Encourage the students to record the algorithm using the horizontal and vertical formats.

Read and discuss the subtraction at the top of page 322. Use a paper strip to illustrate the situation.

Subtracting Fractions



Rewrite a fraction using LCD

Subtract.

Simplify.

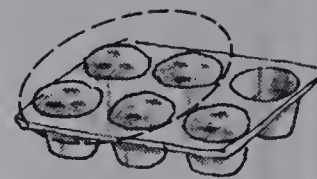
$$\begin{array}{r} \frac{5}{6} \\ - \frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{5}{6} \\ - \frac{3}{6} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{5}{6} \\ - \frac{3}{6} \\ \hline \frac{2}{6} \end{array}$$

$$\frac{2}{6} = \frac{1}{3}$$

So, $\frac{5}{6} - \frac{1}{2} = \frac{1}{3}$



$$\frac{5}{6} - \frac{4}{6} = \frac{1}{6}$$

EXERCISES

Subtract.

- 7 eighths $-$ 6 eighths = \blacksquare eighths 1
- 11 twelfths $-$ 4 twelfths = \blacksquare twelfths 7
- 9 tenths $-$ 6 tenths = \blacksquare tenths 3

Subtract. Write the difference in simplest terms.

- $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$
- $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$
- $\frac{4}{6} - \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$
- $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$
- $\frac{9}{10} - \frac{1}{10} = \frac{8}{10} = \frac{4}{5}$
- $\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$
- $\frac{7}{12} - \frac{1}{12} = \frac{6}{12} = \frac{1}{2}$
- $\frac{8}{9} - \frac{3}{9} = \frac{5}{9}$
- $\frac{7}{10} - \frac{1}{2} = \frac{7}{10} - \frac{5}{10} = \frac{2}{10} = \frac{1}{5}$
- $\frac{7}{10} - \frac{3}{10} = \frac{4}{10} = \frac{2}{5}$
- $\frac{10}{12} - \frac{1}{6} = \frac{10}{12} - \frac{2}{12} = \frac{8}{12} = \frac{2}{3}$
- $\frac{10}{12} - \frac{2}{12} = \frac{8}{12} = \frac{2}{3}$
- $\frac{10}{12} - \frac{10}{12} = 0$
- $\frac{1}{5} - \frac{1}{10} = \frac{2}{10} - \frac{1}{10} = \frac{1}{10}$
- $\frac{7}{12} - \frac{1}{3} = \frac{7}{12} - \frac{4}{12} = \frac{3}{12} = \frac{1}{4}$
- $\frac{2}{3} - \frac{2}{9} = \frac{4}{9} - \frac{2}{9} = \frac{2}{9}$
- $\frac{3}{4} - \frac{3}{8} = \frac{6}{8} - \frac{3}{8} = \frac{3}{8}$
- $\frac{16}{20} - \frac{3}{10} = \frac{16}{20} - \frac{6}{20} = \frac{10}{20} = \frac{1}{2}$

Using the Exercises

- Questions 1 to 3 help the students realize that the denominators must be the same in order to subtract fractions and that only the numerators are subtracted.
- Questions 4 to 11 give practice in subtracting fractions having common denominators.
- Questions 12 to 18 require the students to use the LCD as they rename one fraction, subtract, and then simplify the result. Work a few of these examples together. See that the students are comfortable with both the horizontal and vertical formats.

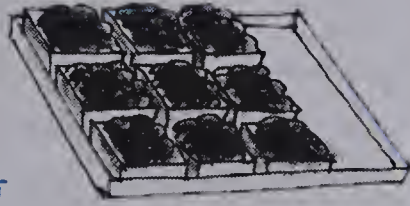
PRACTICE

Subtract. Write the difference in simplest terms.

1. $\frac{2}{4} - \frac{1}{4} = \frac{1}{4}$
2. $\frac{4}{5} - \frac{2}{5} = \frac{2}{5}$
3. $\frac{6}{7} - \frac{3}{7} = \frac{3}{7}$
4. $\frac{5}{9} - \frac{1}{9} = \frac{4}{9}$
5. $\frac{11}{12} - \frac{5}{12} = \frac{1}{2}$
6. $\frac{7}{10} - \frac{3}{10} = \frac{2}{5}$
7. $\frac{7}{8} - \frac{3}{8} = \frac{1}{2}$
8. $\frac{15}{100} - \frac{5}{100} = \frac{1}{10}$
9. $\frac{4}{5} - \frac{7}{10} = \frac{1}{10}$
10. $\frac{5}{7} - \frac{3}{14} = \frac{1}{2}$
11. $\frac{5}{6} - \frac{1}{3} = \frac{1}{2}$
12. $\frac{7}{10} - \frac{2}{5} = \frac{3}{10}$
13. $\frac{11}{12} - \frac{2}{3} = \frac{1}{4}$
14. $\frac{5}{8} - \frac{1}{4} = \frac{3}{8}$
15. $\frac{5}{6} - \frac{5}{12} = \frac{5}{12}$
16. $\frac{20}{25} - \frac{3}{5} = \frac{1}{5}$
17. $\frac{3}{4} - \frac{5}{16} = \frac{7}{16}$
18. $\frac{7}{20} - \frac{1}{10} = \frac{1}{4}$
19. $\frac{9}{10} - \frac{3}{10} = \frac{3}{5}$
20. $\frac{5}{8} - \frac{1}{2} = \frac{1}{8}$

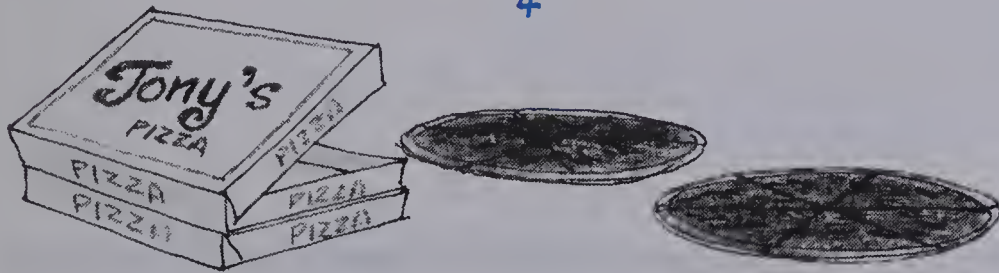
Solve.

21. Anne had $\frac{9}{12}$ of a flat of strawberries. She used $\frac{1}{2}$ of a flat for pies. What fraction of a flat did she have left? $\frac{1}{4}$
22. Jules picked $\frac{7}{8}$ of a pail of blueberries. He gave $\frac{1}{4}$ of the pail to his younger brother. What fraction of the pail of blueberries did he have left? $\frac{5}{8}$



Pizza Puzzle

Some friends were having pizza. The pizzas were all cut into sixths. When Eugene came in, there were 4 pieces left. He ate 2 pieces. Then he cut a piece in half and ate one of the halves. What fraction of a pizza was left? $\frac{1}{4}$



323

Assigning the Practice

Minimum: 1-16

Average: 1-19, 21-22

Enriched: 5-22

Reinforcement

1. Ask the students to use paper strips, as in the lesson, to illustrate questions 9, 10, 11, and 12 of the Practice section on page 323.

2. Have the students complete the following subtraction cross-number puzzles.

a.

$\frac{7}{8}$	$\frac{1}{2}$	
$\frac{1}{4}$	$\frac{1}{8}$	

b.

$\frac{11}{12}$	$\frac{2}{3}$	
$\frac{1}{2}$	$\frac{1}{4}$	

c.

$\frac{19}{20}$		

d.

$\frac{13}{15}$	$\frac{8}{15}$	
$\frac{9}{15}$	$\frac{1}{3}$	

Enrichment

1. Assign *Pizza Puzzle* at the bottom of page 323. Encourage the students to make a drawing to help them solve the problem.

2. Challenge the students to write the following fractions as the difference of two fractions in simplest terms, e.g.,

$\frac{3}{8}$ as a difference is $\frac{5}{8} - \frac{1}{4}$.

- a. $\frac{1}{4}$ b. $\frac{2}{5}$ c. $\frac{1}{3}$ d. $\frac{1}{8}$

Extra Practice

Worksheet A65

Pages 322-323

Subtract. Write the answer in simplest terms.

1. $\frac{3}{10} - \frac{1}{5} = \frac{1}{10}$
2. $\frac{7}{12} - \frac{1}{4} = \frac{1}{3}$
3. $\frac{5}{6} - \frac{1}{2} = \frac{1}{3}$
4. $\frac{5}{16} - \frac{1}{4} = \frac{1}{16}$
5. $\frac{1}{2} - \frac{3}{8} = \frac{1}{8}$
6. $\frac{9}{20} - \frac{1}{4} = \frac{1}{5}$
7. $\frac{11}{14} - \frac{1}{7} = \frac{9}{14}$
8. $\frac{7}{10} - \frac{3}{5} = \frac{1}{10}$
9. $\frac{1}{2} - \frac{1}{4} = \frac{1}{4}$
10. $\frac{7}{8} - \frac{3}{4} = \frac{1}{8}$

Solve.

11. The milk bottle is $\frac{3}{4}$ full. Bill uses $\frac{1}{4}$ bottle for breakfast. How much is left? $\frac{1}{2}$

Objective A66

Subtract fractions with different denominators.

Introducing the Lesson

Have the students find the LCM of these pairs of numbers. Point out that the LCM and the LCD are the same.

- a. 12 and 18 b. 6 and 9
c. 8 and 12 d. 9 and 12

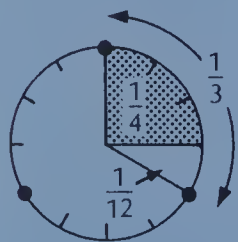
Teaching the Lesson

Draw a cake on the chalkboard.

Indicate how much is $\frac{1}{3}$ of the cake.

“How much bigger is $\frac{1}{3}$ of the cake than $\frac{1}{4}$ of the cake?” Sketch $\frac{1}{4}$ of the cake on top of the $\frac{1}{3}$ for comparison.

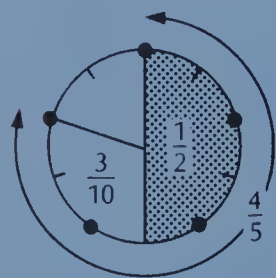
Discuss the LCD for 3 and 4. Divide the whole cake into 12 parts and show that $\frac{1}{3}$ is larger than $\frac{1}{4}$ by $\frac{1}{12}$.



$$\frac{1}{3} - \frac{1}{4}$$

$$\frac{4}{12} - \frac{3}{12} = \frac{1}{12}$$

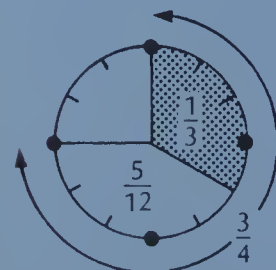
Illustrate the subtraction $\frac{4}{5} - \frac{1}{2}$ with a similar sketch. Discuss the LCD. Point out how the difference can be seen in the illustration.



$$\frac{4}{5} - \frac{1}{2}$$

$$\frac{8}{10} - \frac{5}{10} = \frac{3}{10}$$

Read and discuss the information at the top of page 324. Illustrate the subtraction with a similar sketch.



$$\frac{3}{4} - \frac{1}{3}$$

$$\frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

Different Denominators

Subtract: $\frac{3}{4} - \frac{1}{3}$.

Find the least common denominator.

multiples of 4: 4, 8, 12

multiples of 3: 3, 6, 9, 12

12 is the least common denominator.

Rewrite the fractions using the LCD

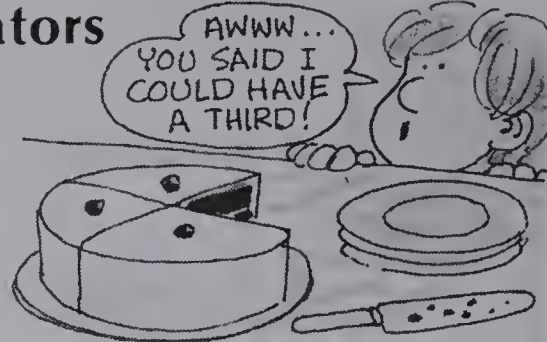
$$\frac{3}{4} = \frac{9}{12}$$

$$\frac{1}{3} = \frac{4}{12}$$

Subtract.

$$\frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

Remember to simplify if possible.



EXERCISES

What is the least common multiple?

1. 5, 10 **10** 2. 10, 30 **30** 3. 2, 8 **8** 4. 3, 12 **12**
5. 4, 6 **12** 6. 6, 8 **24** 7. 6, 9 **18** 8. 4, 5 **20**
9. 3, 7 **21** 10. 4, 7 **28** 11. 2, 5 **10** 12. 4, 9 **36**

Copy and complete.

13. $\frac{5}{6} - \frac{2}{9} = \frac{15}{18} - \frac{4}{18} = \frac{11}{18}$ 14. $\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$ 15. $\frac{5}{6} - \frac{3}{8} = \frac{20}{24} - \frac{9}{24} = \frac{11}{24}$

Subtract. Write the difference in simplest terms.

16. $\frac{2}{3} - \frac{2}{7} = \frac{14}{21} - \frac{6}{21} = \frac{8}{21}$ 17. $\frac{3}{4} - \frac{1}{6} = \frac{9}{12} - \frac{2}{12} = \frac{7}{12}$ 18. $\frac{5}{6} - \frac{3}{8} = \frac{20}{24} - \frac{9}{24} = \frac{11}{24}$ 19. $\frac{5}{9} - \frac{1}{4} = \frac{20}{36} - \frac{9}{36} = \frac{11}{36}$
20. $\frac{4}{5} - \frac{1}{2} = \frac{8}{10} - \frac{5}{10} = \frac{3}{10}$ 21. $\frac{4}{7} - \frac{1}{4} = \frac{16}{28} - \frac{7}{28} = \frac{9}{28}$ 22. $\frac{3}{5} - \frac{2}{9} = \frac{27}{45} - \frac{10}{45} = \frac{17}{45}$ 23. $\frac{5}{6} - \frac{1}{4} = \frac{20}{24} - \frac{6}{24} = \frac{14}{24} = \frac{7}{12}$

Using the Exercises

- Questions 1 to 12 require the students to find the LCM of pairs of numbers.
- Questions 13 to 15 help the students with the vertical format.
- Questions 16 to 23 give practice in both the horizontal and vertical formats. The answer for question 18 needs to be simplified.

PRACTICE

Subtract. Write the difference in simplest terms.

1. $\frac{3}{4} - \frac{5}{12} = \frac{1}{3}$
2. $\frac{2}{3} - \frac{1}{10} = \frac{17}{30}$
3. $\frac{1}{5} - \frac{1}{7} = \frac{2}{35}$
4. $\frac{5}{6} - \frac{1}{2} = \frac{1}{3}$
5. $\frac{4}{5} - \frac{3}{8} = \frac{17}{40}$
6. $\frac{4}{6} - \frac{1}{5} = \frac{7}{15}$
7. $\frac{2}{5} - \frac{1}{4} = \frac{3}{20}$
8. $\frac{7}{8} - \frac{5}{6} = \frac{1}{24}$
9. $\frac{4}{9} - \frac{1}{4} = \frac{7}{36}$
10. $\frac{3}{8} - \frac{1}{12} = \frac{7}{24}$
11. $\frac{7}{8} - \frac{2}{3} = \frac{5}{24}$
12. $\frac{5}{9} - \frac{1}{6} = \frac{7}{18}$

Solve.

13. The Kanjis had about $\frac{3}{4}$ of a bag of peas in their freezer. After they used some for supper, about $\frac{1}{3}$ of a bag was left. What fraction of the bag did they use for supper? $\frac{5}{12}$
14. The McKays estimated that they had used $\frac{2}{3}$ of their winter wood supply. They are half way through the winter.
 - a. What fraction of their supply is left? $\frac{1}{3}$
 - b. Are they likely to need more wood before the end of winter? *Yes.*

Going in Reverse

Find the missing number.

- a. $\frac{2}{3} - \frac{5}{8} = \frac{1}{24}$
- b. $\frac{2}{5} - \frac{1}{6} = \frac{7}{30}$
- c. $\frac{5}{6} - \frac{5}{12} = \frac{5}{12}$
- d. $\frac{5}{8} - \frac{5}{12} = \frac{5}{24}$



325

Assigning the Practice

Minimum: 1-13

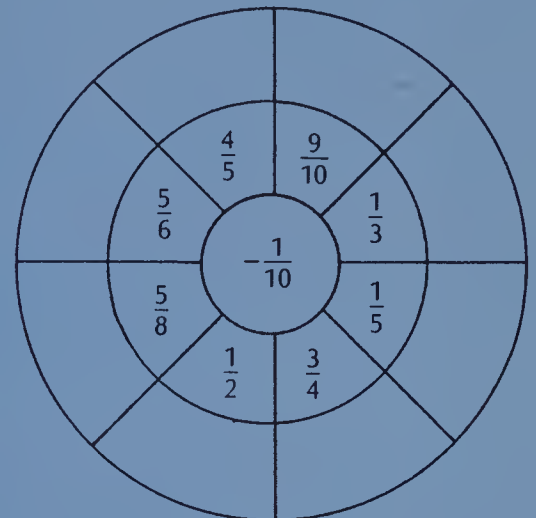
Average: 1-14

Enriched: 1-14

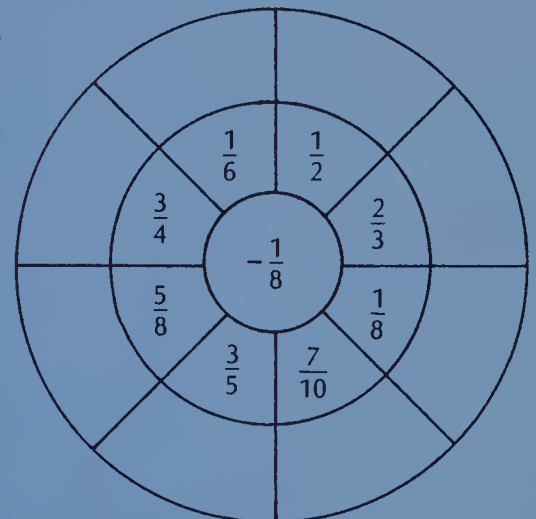
Reinforcement

1. Have the students complete the following number wheels.

a.



b.



2. Ask the students these questions.

- a. Which is a bigger piece of cake, $\frac{1}{6}$ of it or $\frac{2}{11}$ of it? How much bigger?
- b. Which is a bigger piece of cake, $\frac{2}{7}$ of it or $\frac{3}{9}$ of it? How much bigger?

Enrichment

1. Assign *Going in Reverse* at the bottom of page 325.
2. Point out that the Egyptians wrote $\frac{1}{2}$ as $\overline{\text{N}}$, $\frac{1}{3}$ as $\overline{\text{N}}$, and $\frac{1}{4}$ as $\overline{\text{N}}$. For $\frac{3}{4}$, they wrote $\overline{\text{N}}$ $\overline{\text{N}}$ $\overline{\text{N}}$. How would they write $\frac{2}{5}$, $\frac{1}{6}$, $\frac{3}{7}$, $\frac{1}{8}$, and $\frac{7}{10}$?

Extra Practice

Subtract. Write the answer in simplest terms.

1. $\frac{1}{3} - \frac{1}{5} = \frac{2}{15}$
2. $\frac{4}{7} - \frac{1}{2} = \frac{1}{14}$
3. $\frac{1}{2} - \frac{1}{5} = \frac{3}{10}$
4. $\frac{3}{4} - \frac{1}{6} = \frac{5}{12}$
5. $\frac{5}{9} - \frac{1}{4} = \frac{11}{36}$
6. $\frac{7}{8} - \frac{2}{3} = \frac{5}{24}$
7. $\frac{5}{6} - \frac{3}{8} = \frac{11}{24}$
8. $\frac{5}{9} - \frac{1}{2} = \frac{1}{18}$
9. $\frac{7}{10} - \frac{1}{4} = \frac{9}{20}$

10. It takes $\frac{2}{3}$ of an hour to bake cookies and $\frac{3}{4}$ of an hour to bake a cake. How much longer does it take to bake the cake? $\frac{1}{12}$ h

Worksheet A66

Pages 324-325

Objective A67

Subtract mixed numerals without regrouping the minuend.

Introducing the Lesson

Use chalkboard sketches to review the addition of mixed numerals.



$$1\frac{4}{5} + 1\frac{3}{5} = 2\frac{7}{5} = 3\frac{2}{5}$$



$$1\frac{1}{2} + 1\frac{1}{3} = 1\frac{5}{6}$$

Teaching the Lesson

Explain and illustrate the subtraction of mixed numerals with several examples similar to the following.



$$2\frac{4}{7} - 1\frac{1}{7} = 1\frac{3}{7}$$



$$2\frac{2}{3} - 1\frac{1}{4} = 1\frac{5}{12}$$

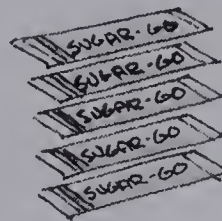
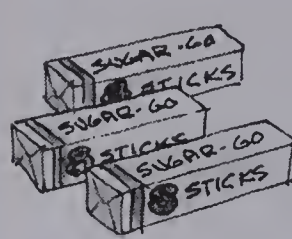
$2\frac{2}{3}$	$2\frac{8}{12}$
$-1\frac{1}{4}$	$-1\frac{3}{12}$
<hr/>	<hr/>
	$1\frac{5}{12}$

Point out the subtraction of $1\frac{1}{8}$ packages of gum from $3\frac{5}{8}$ packages of gum at the top of page 326. Note that if one full package and one stick of gum were crossed out, or $1\frac{1}{8}$ packages, the remainder could be counted.

Also, discuss the subtraction of $1\frac{1}{6}$ dozen eggs from $2\frac{3}{4}$ dozen. Explain that if one full dozen plus 2 eggs were crossed out, or $1\frac{1}{6}$ dozen eggs, one dozen plus 7 eggs, or $1\frac{7}{12}$ dozen, would remain.

Point out that some problems require finding common denominators and/or simplifying the differences.

Subtracting Mixed Numerals

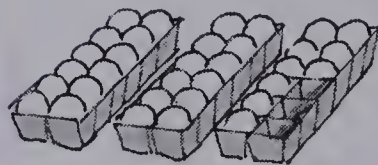


Subtract

$$\begin{array}{r} 3\frac{5}{8} \\ -1\frac{1}{8} \\ \hline 2\frac{4}{8} \end{array}$$

$$2\frac{4}{8} = 2\frac{1}{2}$$

$$3\frac{5}{8} - 1\frac{1}{8} = 2\frac{1}{2}$$



Rewrite using the LCD

$$\begin{array}{r} 2\frac{3}{4} \\ -1\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 2\frac{9}{12} \\ -1\frac{2}{12} \\ \hline \end{array}$$

Subtract

$$\begin{array}{r} 2\frac{9}{12} \\ -1\frac{2}{12} \\ \hline 1\frac{7}{12} \end{array}$$

$$\text{So, } 2\frac{3}{4} - 1\frac{1}{6} = 1\frac{7}{12}$$

Subtract the fractions first, then the whole numbers.

EXERCISES

Subtract. Write the difference in simplest terms.

- $2\frac{5}{8} - 1\frac{4}{8} = 1\frac{1}{8}$
- $6\frac{3}{4} - 4\frac{1}{4} = 2\frac{2}{4} = 2\frac{1}{2}$
- $5\frac{5}{9} - 3\frac{4}{9} = 2\frac{1}{9}$
- $7\frac{5}{6} - 2\frac{1}{6} = 5\frac{4}{6} = 5\frac{2}{3}$
- $3\frac{4}{7} - 1\frac{2}{7} = 2\frac{2}{7}$
- $8\frac{7}{10} - 5\frac{3}{10} = 3\frac{4}{10} = 3\frac{2}{5}$
- $9\frac{7}{12} - 8\frac{1}{12} = 1\frac{6}{12} = 1\frac{1}{2}$
- $4\frac{1}{2} - 2\frac{1}{2} = 2$
- $6\frac{8}{10} - 1\frac{1}{2} = 5\frac{3}{10}$
- $3\frac{1}{4} - 1\frac{1}{8} = 2\frac{1}{8}$
- $7\frac{5}{12} - 4\frac{1}{3} = 3\frac{1}{12}$
- $8\frac{2}{3} - 5\frac{2}{9} = 3\frac{4}{9}$
- $9\frac{2}{5} - 3\frac{4}{10} = 6$
- $4\frac{3}{4} - 1\frac{2}{3} = 3\frac{1}{12}$
- $5\frac{3}{5} - 2\frac{1}{4} = 3\frac{7}{20}$
- $8\frac{7}{8} - \frac{1}{6} = 8\frac{17}{24}$
- $13\frac{4}{5} - 11\frac{2}{6} = 2\frac{7}{15}$

Using the Exercises

- Questions 1 to 8 use the horizontal format for subtractions already having common denominators. Note that some differences here need to be simplified.
- Questions 9 to 13 use the vertical format for subtractions with unlike denominators, with one denominator being a multiple of the other. Stress that the fractions are subtracted before the whole numbers.
- Questions 14 to 17 use the horizontal format for subtractions with unlike denominators, with no multiples in the pairs of denominators.

PRACTICE

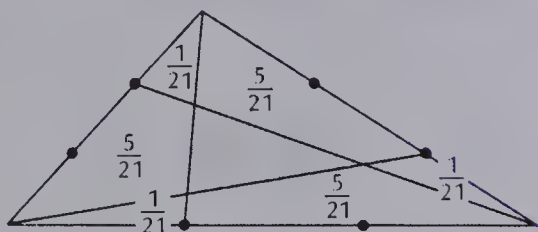
Subtract. Write the difference in simplest terms.

1. $6\frac{7}{12} - 2\frac{1}{2} = 4\frac{1}{2}$
2. $8\frac{3}{4} - 7\frac{1}{6} = 1\frac{7}{12}$
3. $5\frac{7}{10} - 3\frac{1}{5} = 2\frac{1}{2}$
4. $4\frac{2}{3} - 1\frac{1}{8} = 3\frac{13}{24}$
5. $7\frac{5}{8} - 2\frac{1}{6} = 5\frac{11}{24}$
6. $3\frac{7}{8} - 1\frac{1}{4} = 2\frac{5}{8}$
7. $8\frac{9}{10} - 5\frac{1}{2} = 3\frac{2}{5}$
8. $3\frac{2}{3} - 1\frac{3}{10} = 2\frac{11}{30}$
9. $2\frac{4}{5} - 1\frac{4}{15} = 1\frac{8}{15}$
10. $13\frac{7}{12} - 1\frac{1}{6} = 12\frac{5}{12}$
11. $9\frac{5}{6} - \frac{2}{5} = 9\frac{13}{30}$
12. $20\frac{5}{7} - 8\frac{3}{14} = 12\frac{1}{2}$
13. $3\frac{2}{3} - \frac{3}{7} = 3\frac{5}{21}$
14. $8\frac{3}{12} - 6\frac{1}{4} = 2$
15. $5\frac{4}{5} - \frac{1}{5} = 5\frac{3}{5}$
16. $20\frac{7}{8} - 9\frac{2}{3} = 11\frac{5}{24}$

Solve.

17. Sunset Orange Juice Company sold $2\frac{1}{2}$ million dollars worth of juice last year. This year, sales decreased by $\frac{3}{4}$ million dollars. What were this year's sales? $1\frac{3}{4}$ million.
18. Roberto planted $3\frac{1}{2}$ rows of vegetables. Onions take up $\frac{1}{2}$ row, carrots $\frac{3}{4}$ row, peas $1\frac{1}{3}$ row, radishes $\frac{1}{4}$ row, and corn the rest. How many rows of corn does he have? $\frac{2}{3}$ row.

Triangular Fractions



The sides of the triangle are divided in thirds.

The fractions show the part of the total area taken up by each section.

What fraction of the whole triangle is in the shaded section? $\frac{1}{7}$

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Extra Practice

Subtract. Write the difference in simplest terms.

1. $2\frac{5}{8} - 1\frac{1}{4} = 1\frac{3}{8}$

2. $3\frac{4}{5} - 2\frac{1}{2} = 1\frac{3}{10}$

3. $4\frac{1}{2} - 3\frac{3}{8} = 1\frac{1}{8}$

4. $7\frac{7}{8} - 3\frac{1}{3} = 4\frac{13}{24}$

5. $2\frac{3}{4} - 1\frac{3}{10} = 1\frac{9}{20}$

6. $7\frac{5}{6} - 4\frac{1}{4} = 3\frac{7}{12}$

7. $7\frac{7}{10} - 2\frac{5}{15} = 5\frac{11}{30}$

8. $9\frac{4}{5} - 2\frac{3}{4} = 7\frac{1}{20}$

9. $2\frac{5}{8} - 1\frac{1}{3} = 1\frac{7}{24}$

Solve.

10. The class had $5\frac{1}{2}$ watermelons. The girls ate $2\frac{1}{6}$ of the watermelons and the boys ate the rest. How much did the boys eat? $3\frac{1}{3}$

Assigning the Practice

Minimum: 1-16

Average: 1-16

Enriched: 1-18

Reinforcement

1. Ask the students to complete the following tables.

a.

-	$4\frac{1}{2}$	$5\frac{3}{4}$	$7\frac{5}{8}$	$5\frac{5}{6}$	$6\frac{7}{10}$
$3\frac{1}{2}$					

b.

-	$6\frac{2}{3}$	$7\frac{5}{6}$	$10\frac{3}{4}$	$4\frac{3}{5}$	$8\frac{7}{9}$
$2\frac{1}{3}$					

c.

-	$11\frac{4}{5}$	$7\frac{1}{2}$	$9\frac{2}{3}$	$12\frac{5}{8}$	$10\frac{3}{4}$
$5\frac{1}{5}$					

2. Have the students find the missing mixed numeral in each.

a. $5\frac{3}{4}$	b.
	$-4\frac{1}{6}$
$3\frac{5}{8}$	$3\frac{1}{2}$
c. $7\frac{2}{3}$	d. $5\frac{2}{5}$
$3\frac{4}{15}$	$2\frac{3}{10}$

Enrichment

1. Assign *Triangular Fractions* at the bottom of page 327.

2. Ask the students to use $2\frac{1}{6}$, $3\frac{1}{4}$, $4\frac{1}{3}$, and $6\frac{1}{2}$ to make these statements true.

a. $\blacksquare - \blacksquare = 1\frac{1}{2}$

b. $\blacksquare - \blacksquare = 3\frac{1}{4}$

c. $(\blacksquare + \blacksquare) - \blacksquare = 5\frac{5}{12}$

d. $(\blacksquare - \blacksquare) - \blacksquare = 1\frac{1}{12}$

Objective A68

Subtract mixed numerals by regrouping the minuend.

Introducing the Lesson

Recall how mixed numerals can be regrouped.

$$3\frac{5}{4} = 4\frac{1}{4}$$

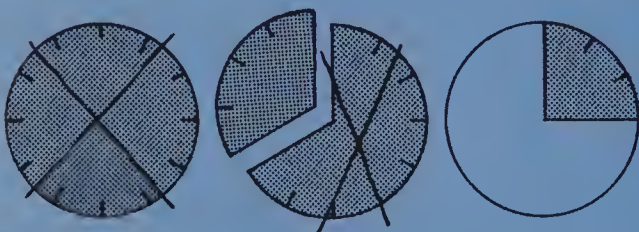

Have the students practice the following kind of regrouping.

a. $6\frac{1}{5} = 5\frac{?}{5}$ b. $9\frac{1}{2} = 8\frac{?}{2}$

c. $2\frac{1}{7} = 1\frac{?}{7}$ d. $3\frac{1}{4} = 2\frac{?}{4}$

Teaching the Lesson

Read the problem at the top of page 328. Use a chalkboard sketch to illustrate the subtraction. Show on the sketch how the fractions could not be subtracted since $\frac{1}{4}$ is smaller than $\frac{2}{3}$. Hence, the $\frac{2}{3}$ had to be taken away from a whole.

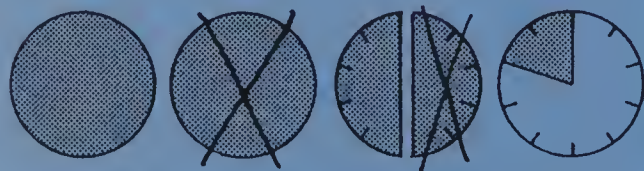


$$2\frac{1}{4} - 1\frac{2}{3} = \frac{7}{12}$$

$$2\frac{3}{12} - 1\frac{8}{12} = 1\frac{15}{12} - 1\frac{8}{12} = \frac{7}{12}$$

Discuss the subtraction algorithm and point out the choosing of the LCD and the regrouping of the minuend, $2\frac{3}{12}$ to $1\frac{15}{12}$.

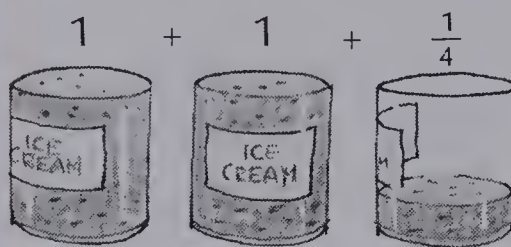
Provide other illustrated examples similar to the following.



$$3\frac{1}{5} - 1\frac{1}{2} = 1\frac{7}{10}$$

$$3\frac{2}{10} - 1\frac{5}{10} = 2\frac{12}{10} - 1\frac{5}{10} = 1\frac{7}{10}$$

Subtracting Mixed Numerals



Rewrite with the LCD.

$$\begin{array}{r} 2\frac{1}{4} \longrightarrow 2\frac{3}{12} \\ - 1\frac{2}{3} \longrightarrow - 1\frac{8}{12} \\ \hline \end{array}$$

Regroup

$$\begin{array}{r} 1\frac{15}{12} \\ 2\frac{3}{12} \\ - 1\frac{8}{12} \\ \hline \end{array}$$

Subtract.

$$\begin{array}{r} 1\frac{15}{12} \\ 2\frac{3}{12} \\ - 1\frac{8}{12} \\ \hline 1\frac{7}{12} \end{array}$$

Remember to simplify the answer if possible.

So, $2\frac{1}{4} - 1\frac{2}{3} = \frac{7}{12}$

EXERCISES

Regroup.

1. $2\frac{1}{3} = 1\frac{4}{3}$ 2. $8\frac{2}{5} = 7\frac{7}{5}$ 3. $5\frac{4}{7} = 4\frac{11}{7}$ 4. $3\frac{3}{8} = 2\frac{11}{8}$
5. $4\frac{3}{10} = 3\frac{13}{10}$ 6. $7\frac{1}{6} = 6\frac{7}{6}$ 7. $9\frac{3}{5} = 8\frac{8}{5}$ 8. $6\frac{4}{9} = 5\frac{13}{9}$

Subtract. Write the difference in simplest terms.

9. $6\frac{1}{6} - 4\frac{5}{6} = 1\frac{2}{3}$ 10. $8\frac{3}{10} - 2\frac{7}{10} = 5\frac{6}{10} = 5\frac{3}{5}$ 11. $9\frac{1}{12} - 7\frac{5}{12} = 1\frac{8}{12} = 1\frac{2}{3}$ 12. $5\frac{1}{4} - 2\frac{3}{4} = 2\frac{2}{4} = 2\frac{1}{2}$ 13. $4\frac{3}{8} - 1\frac{7}{8} = 2\frac{4}{8} = 2\frac{1}{2}$
14. $5\frac{1}{3} - 3\frac{5}{6} = 1\frac{2}{6} = 1\frac{1}{3}$ 15. $4\frac{1}{2} - 1\frac{3}{4} = 2\frac{2}{4} = 2\frac{1}{2}$ 16. $6\frac{3}{8} - 2\frac{3}{4} = 3\frac{5}{8}$ 17. $5\frac{2}{9} - 2\frac{2}{3} = 2\frac{4}{9}$ 18. $3\frac{1}{4} - 1\frac{5}{12} = 1\frac{1}{6}$
19. $7\frac{2}{5} - 1\frac{2}{3} = 5\frac{14}{15}$ 20. $6\frac{1}{4} - 2\frac{17}{20} = 3\frac{17}{20}$ 21. $5\frac{1}{3} - 4\frac{7}{8} = \frac{11}{24}$ 22. $14\frac{3}{10} - 11\frac{2}{3} = 2\frac{19}{30}$

Using the Exercises

- Questions 1 to 8 require the students to regroup mixed numerals.
- Questions 9 to 13 involve subtracting mixed numerals with common denominators. In each case, however, the minuend must be regrouped.
- Questions 14 to 22 involve subtracting mixed numerals which need common denominators. Both the horizontal and vertical formats are used.

PRACTICE

Regroup.

$$1. 4\frac{2}{3} = 3\frac{5}{3} \quad 2. 7\frac{3}{4} = 6\frac{7}{4} \quad 3. 5\frac{2}{5} = 4\frac{7}{5} \quad 4. 3\frac{4}{5} = 2\frac{9}{5}$$

$$5. 5\frac{2}{4} = 4\frac{6}{4} \quad 6. 7\frac{2}{3} = 6\frac{5}{3} \quad 7. 6\frac{2}{5} = 5\frac{7}{5} \quad 8. 8\frac{5}{6} = 7\frac{11}{6}$$

Subtract. Write the difference in simplest terms.

$$9. \begin{array}{r} 7\frac{5}{8} \\ - 2\frac{3}{4} \\ \hline 4\frac{7}{8} \end{array} \quad 10. \begin{array}{r} 7\frac{1}{6} \\ - 4\frac{4}{9} \\ \hline 2\frac{13}{18} \end{array} \quad 11. \begin{array}{r} 10\frac{2}{3} \\ - 3\frac{3}{4} \\ \hline 6\frac{11}{12} \end{array} \quad 12. \begin{array}{r} 5\frac{1}{3} \\ - 4\frac{3}{4} \\ \hline 1\frac{7}{12} \end{array} \quad 13. \begin{array}{r} 9\frac{3}{10} \\ - 4\frac{3}{5} \\ \hline 4\frac{7}{10} \end{array}$$

$$14. 7\frac{3}{5} - 4\frac{3}{4} = 2\frac{17}{20} \quad 15. 9\frac{1}{2} - 6\frac{7}{8} = 2\frac{5}{8} \quad 16. 9\frac{3}{16} - 1\frac{3}{8} = 7\frac{13}{16} \quad 17. 5\frac{1}{16} - 4\frac{5}{8} = \frac{7}{16}$$

$$18. 6\frac{1}{3} - 4\frac{4}{5} = 1\frac{8}{15} \quad 19. 13\frac{7}{10} - 9\frac{5}{6} = 3\frac{17}{30} \quad 20. 24\frac{1}{2} - 18\frac{5}{6} = 5\frac{2}{3} \quad 21. 10\frac{2}{7} - 8\frac{1}{3} = 1\frac{20}{21}$$

Solve.

22. Jan made popcorn for a party. She started with $1\frac{1}{2}$ boxes of corn. When she was finished, about $\frac{2}{3}$ of a box was left. How much corn did she use? $\frac{5}{6}$

Fraction ABCs

1. A, B, and C represent three different numerals between 1 to 9. What are they?

$$\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = 1$$

$\begin{matrix} 2 \\ 3 \\ 6 \end{matrix}$

2. P and Q represent two different numerals between 1 and 9. What are they?

$$\frac{P}{Q} - \frac{Q}{P} = \frac{P+Q}{P \times Q}$$

$$P - Q = 1 \quad (P, Q) = (2, 1) \text{ or } (3, 2) \text{ or } (4, 3) \text{ or } (5, 4) \text{ etc.}$$

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Extra Practice

Worksheet A68

Pages 328-329

Subtract. Write the difference in simplest terms.

$$1. \begin{array}{c} \text{5 circles} \\ 4\frac{1}{5} - 1\frac{1}{3} = 2\frac{13}{15} \end{array} \quad 2. \begin{array}{c} \text{2 circles, 3 sectors} \\ 2\frac{1}{2} - 1\frac{3}{4} = \frac{3}{4} \end{array}$$

$$3. \begin{array}{r} 5\frac{1}{2} \\ - 1\frac{2}{3} \\ \hline 3\frac{5}{6} \end{array} \quad 4. \begin{array}{r} 8\frac{5}{8} \\ - 6\frac{3}{4} \\ \hline 1\frac{7}{8} \end{array} \quad 5. \begin{array}{r} 1\frac{3}{10} \\ - \frac{1}{2} \\ \hline \frac{4}{5} \end{array} \quad 6. \begin{array}{r} 6\frac{1}{4} \\ - 3\frac{2}{3} \\ \hline 2\frac{7}{12} \end{array}$$

$$7. 7\frac{3}{16} - 4\frac{7}{8} = 2\frac{5}{16} \quad 8. 4\frac{3}{10} - 2\frac{1}{3} = 1\frac{23}{30} \quad 9. 9\frac{7}{15} - \frac{7}{10} = 8\frac{13}{30}$$

Solve.

10. There are $2\frac{1}{2}$ dozen eggs in the refrigerator. If $1\frac{3}{4}$ dozen are used for breakfast, how many dozen remain? $\frac{3}{4}$

Assigning the Practice

Minimum: 1-17

Average: 1-22

Enriched: 1-22

Reinforcement

1. Have the students use the illustrations as they regroup these mixed numerals.

a. $2\frac{1}{3} = 1\frac{4}{3}$ 

b. $3\frac{3}{5} = 2\frac{8}{5}$ 

c. $1\frac{1}{8} = 0\frac{9}{8}$ 

d. $3\frac{1}{6} = 2\frac{7}{6}$ 

2. Ask the students to complete these cross-number puzzles.

a. $8\frac{1}{4} \quad 5\frac{1}{2}$ b. $11\frac{2}{3} \quad 7\frac{3}{4}$

$6\frac{1}{5} \quad 3\frac{1}{8}$ $9\frac{2}{5} \quad 4\frac{1}{8}$

Enrichment

1. Assign *Fraction ABCs* at the bottom of page 329.

2. Discuss how whole numbers can be regrouped as mixed numerals, e.g., $10 = 9\frac{5}{5}$. Then have the students find the following differences.

a. $10 - 8\frac{1}{5} = \blacksquare$

b. $15 - 13\frac{3}{4} = \blacksquare$

c. $20 - 16\frac{7}{9} = \blacksquare$

d. $5 - 4\frac{7}{8} = \blacksquare$

3. Ask the students to subtract the following as mixed numerals and as decimals and then tell which form they prefer using.

a. $5\frac{3}{5} - 2\frac{3}{4} =$ b. $15\frac{3}{5} - 9\frac{9}{10} =$

Objective A69

Determine probability.

Introducing the Lesson

Have the students discuss the meaning and reasons for such statements as, "There is a 100% probability of rain today." "There is a 50% probability of a thunder storm." Point out that this branch of mathematics is called probability and that a numerical value is placed on the prediction of the occurrence or non-occurrence of certain events.

Teaching the Lesson

Have the students work in pairs as they do the lesson's probability activities.

Give each pair of students a spinner like the one on the left at the top of page 330. Then discuss the information about this spinner given on the page. Point out that probability can be determined by the fraction:

$$\frac{\text{number of expected outcomes}}{\text{number of possible outcomes}}$$

Have the students determine the probability of spinning:

- red, $\frac{1}{3}$
- black, $\frac{0}{3}$
- blue or yellow, $\frac{2}{3}$.

Now ask the students to spin their spinners 60 times, tally the results, and write a fraction for each colour. The fractions might look like the following. Explain that each fraction is equal to

or nearly equal to $\frac{1}{3}$. Thus, the outcome was predictable. The probability was determined correctly.

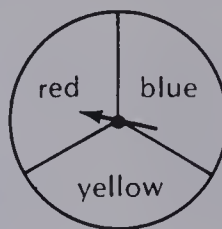
$$\frac{19 \text{ red}}{60 \text{ in all}} \quad \frac{20 \text{ blue}}{60 \text{ in all}} \quad \frac{21 \text{ yellow}}{60 \text{ in all}}$$

Give each pair of students a spinner like the one on the right at the top of page 330. Have the students determine the probability of spinning:

- white, $\frac{1}{4}$
- green, $\frac{2}{4}$ or $\frac{1}{2}$
- red, $\frac{0}{4}$
- brown or green, $\frac{3}{4}$.

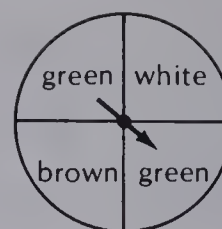
Then have the students spin their spinners 80 times and test their predictions.

Probability



There is one chance in three of spinning red.

The **probability** of red is $\frac{1}{3}$.



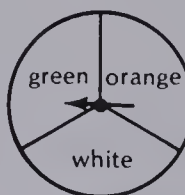
There are two chances in four of spinning green.

The probability of green is $\frac{2}{4}$ (or $\frac{1}{2}$).

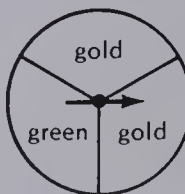
$$\text{Probability} = \frac{\text{number of expected outcomes}}{\text{number of possible outcomes}}$$

EXERCISES

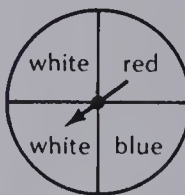
Find the probability.



- The probability of green is $\frac{1}{3}$.
- The probability of orange is $\frac{1}{3}$.
- The probability of white is $\frac{1}{3}$.



- The probability of gold is $\frac{2}{3}$.
- The probability of green is $\frac{1}{3}$.
- The probability of red is $\frac{0}{3}$.



- The probability of white is $\frac{2}{4} = \frac{1}{2}$.
- The probability of red is $\frac{1}{4}$.
- The probability of blue is $\frac{1}{4}$.

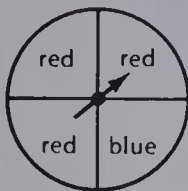
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Using the Exercises

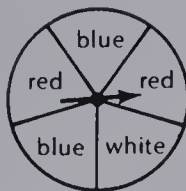
- Provide spinners as shown in questions 1 to 9. Have the students predict the outcomes for the events. Then have them spin the spinners 60 times to prove their predictions. Discuss the results. Point out how spinning a colour, e.g., green, 20 times out of 60 is the same as what was predicted because $\frac{20}{60} = \frac{1}{3}$.

PRACTICE

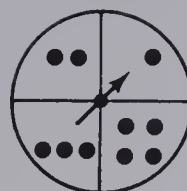
What is the probability?



1. red $\frac{3}{4}$
2. blue $\frac{1}{4}$



3. red $\frac{2}{6}$
4. blue $\frac{2}{6}$
5. white $\frac{1}{6}$
6. green $\frac{0}{6}$

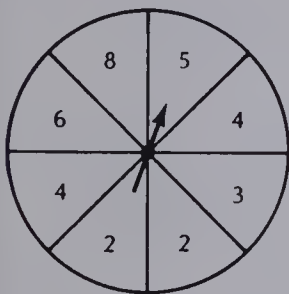


7. ● $\frac{1}{4}$
8. • $\frac{1}{4}$
9. ●● $\frac{1}{4}$
10. ●●● $\frac{1}{4}$

Solve.

11. A spinner has six sections: red, gold, green, red, red, and gold. What is the probability of spinning a gold? a red? a green?
 $\frac{2}{6} = \frac{1}{3}$ $\frac{3}{6} = \frac{1}{2}$ $\frac{1}{6}$
12. A coin is tossed. What is the probability of tossing heads? tails?
 $\frac{1}{2}$ $\frac{1}{2}$
13. Suppose a spinner has four sections, all red. What is the probability of spinning red? black? $\frac{4}{4}$, $\frac{0}{4}$

Spinnerama



What is the probability?

1. 5 $\frac{1}{8}$
2. 4 $\frac{2}{8} = \frac{1}{4}$
3. 3 $\frac{1}{8}$
4. 2 $\frac{3}{8} = \frac{3}{4}$
5. 6 $\frac{1}{8}$
6. 8 $\frac{1}{8}$
7. 10 0
8. a number less than 5 $\frac{5}{8}$
9. an odd number $\frac{1}{4}$
10. an even number $\frac{3}{4}$
11. 8 or 5 $\frac{1}{4}$
12. 3 or 4 $\frac{3}{8}$

331

Assigning the Practice

Minimum: 1-11

Average: 1-13

Enriched: 1-13

Reinforcement

1. Assign *Spinnerama* at the bottom of page 331. Provide materials so the students can test their predictions.

2. Give pairs of students a coin. Ask them to predict the chances for flipping a head and for flipping a tail. Have them flip the coin 50 times to test their predictions.

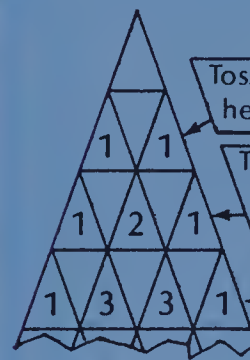
3. Tell pairs of students to place 12 different names in a bag and to predict the chances for picking one of the names. Then ask them to prove their predictions by picking names 60 times.

4. Give pairs of students a die. Have them predict the chances of rolling a 1, 2, 3, 4, 5, or 6; 2 or 3; an even number; an odd number. Have them roll the die 60 times to test their predictions.

Enrichment

Pascal's Triangle, as shown on page 123, is a summation of this French mathematician's rules about the probabilities of getting heads or tails on the toss of a coin.

Ask the students to toss one, two, three, etc. coins to prove Pascal's findings.



Toss 1 coin. The chance of getting heads is 1 in 2 or $\frac{1}{2}$.

Toss 2 coins. Chances of getting 2 heads is 1 in 4; 1 head and 1 tail is 2 in 4; 2 tails is 1 in 4.

Toss 3 coins. Chances of getting all heads is 1 in 8; 2 heads and 1 tail is 3 in 8; 2 tails and 1 head is 3 in 8; all tails is 1 in 8.

Extra Practice

Worksheet A69

Pages 330-331

Suppose you shuffled these cards and then placed them face down.



The top card is turned over. What is the probability that it is:

1. a 7 $\frac{1}{10}$
2. a 1, 2, or 3 $\frac{3}{10}$
3. an even number $\frac{1}{2}$
4. a number less than 11 $\frac{1}{10}$
5. a number greater than 8 $\frac{1}{5}$
6. a 15 0
7. a multiple of 2 $\frac{1}{2}$
8. an odd number $\frac{1}{2}$
9. a prime number $\frac{2}{5}$
10. a number evenly divisible by 3 $\frac{1}{10}$

Objective PS15

Use diagrams and models to solve problems.

Introducing the Lesson

Point out the *Pizza Puzzle* problem at the bottom of page 323. Ask a student who solved the problem to draw the situation. Show how the drawing is useful in solving the problem. Explain that such a strategy is often used in problem solving.

Teaching the Lesson

Read and discuss the two problems at the top of page 332. Show how the diagram of the irrigated field problem and the use of a model in the die problem enable one to better visualize the problems and to solve them.

Read and discuss the following problems which have appeared in this book. Use a model or a diagram to illustrate each situation and point out their solutions.

- Coin Question*, page 41
- Cutting the Pie*, page 87
- Fenced In*, page 101
- Crow's Nest Pass*, page 109

Problem Solving



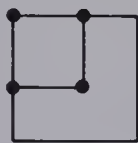
A farmer has a square garden with irrigation outlets at the four corners. He wants to enlarge the garden so that it is still square but twice its present size. He doesn't want to move the present outlets so they should be on the edges of the field. How can he lay out the enlarged field?

Use a diagram.

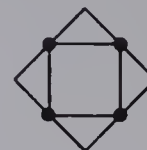
present field



experiment



no outlets



Victor rolled a die. What is the probability he rolled a 6? an even number?

Use a model.



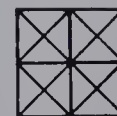
The probability of rolling a 6 is $\frac{1}{6}$

The probability of rolling an even number is $\frac{3}{6}$ or $\frac{1}{2}$.

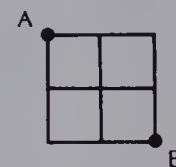
EXERCISES

Use a model or a diagram to solve the problem.

- How many different squares are there in this diagram? **10**



- What is the probability of getting two heads when you toss two coins?
Hint. Show all the possible outcomes. **$\frac{1}{4}$**

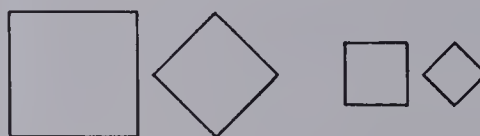


- How many different ways are there to walk from A to B without retracing your steps? **12**

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Using the Exercises

- For question 1, the students should draw and then count the different sizes of squares.



- Students need two coins to model all possible outcomes in question 2.

(H) (H), (H) (T), (T) (H), and (T) (T)

- For question 3, students might trace the different paths from A to B.



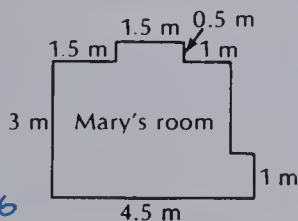
Problem Solving Activities

Assign Level 6, Unit 14

PRACTICE

Use a model or a diagram to solve.

1. Ted walked 2 km north, then 3 km east. Then he walked 1.5 km south, 2 km west, and 0.5 km south. How far is he from where he started? *1 km east.*
2. How many tiles 2 cm by 3 cm can be put in a frame 7 cm by 11 cm? (No overlapping.) *12*
3. There are four red socks and six blue socks in a drawer. You pull out a blue sock. What is the probability of picking another blue sock? *$\frac{5}{7}$*
4. How many square metres of carpet will Mary need to cover her room? *13.25 m²*
5. Jeanne, Ken, and Lois are the top three students on the honours list. How many different ways might they place? *6*



REVIEW

Subtract. Write the difference in simplest terms.

- | | | | |
|-----|--|--|--|
| A65 | 1. $\frac{2}{5} - \frac{1}{10} = \frac{3}{10}$ | 2. $\frac{2}{3} - \frac{2}{9} = \frac{4}{9}$ | 3. $\frac{3}{4} - \frac{1}{8} = \frac{5}{8}$ |
| A66 | 4. $\frac{3}{5} - \frac{1}{2} = \frac{1}{10}$ | 5. $\frac{3}{7} - \frac{1}{4} = \frac{5}{28}$ | 6. $\frac{5}{6} - \frac{3}{8} = \frac{11}{24}$ |
| A67 | 7. $3\frac{3}{4} - 1\frac{2}{3} = 2\frac{1}{12}$ | 8. $7\frac{5}{12} - 2\frac{1}{3} = 5\frac{1}{12}$ | 9. $8\frac{4}{5} - 3\frac{1}{6} = 5\frac{17}{30}$ |
| A68 | 10. $5\frac{3}{8} - 2\frac{3}{4} = 2\frac{5}{8}$ | 11. $7\frac{1}{4} - 3\frac{2}{5} = 3\frac{17}{20}$ | 12. $9\frac{3}{5} - 5\frac{2}{3} = 3\frac{14}{15}$ |

What is the probability?

- | | | | |
|-----|-------------------|-------------------|-------------------|
| A69 | 13. $\frac{1}{5}$ | 14. $\frac{3}{5}$ | 15. $\frac{5}{0}$ |
|-----|-------------------|-------------------|-------------------|



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Assigning the Practice

Minimum: 1-3

Average: 1-4

Enriched: 1-5

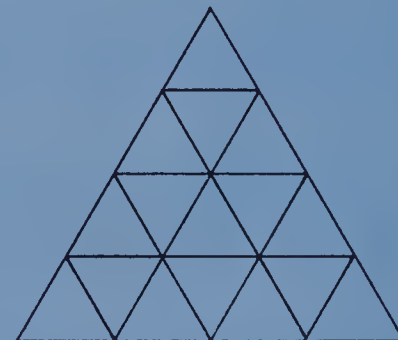
Review Exercises

Questions	Objective	Pages
1-3	A65	322-323
4-6	A66	324-325
7-9	A67	326-327
10-12	A68	328-329
13-15	A69	330-331

Reinforcement

Have the students use models or diagrams to solve the following problems.

1. A square cake pan has a perimeter of 80 cm. What is its area?
2. How many whole pizzas are needed for 6 people if each person eats $\frac{3}{4}$ of a pizza? How much is left over?
3. A rectangular garden has an area of 36 m². What could its perimeter be?
4. How many triangles?



Enrichment

The following stack of cubes has 4 layers. How many cubes would there be in a similar stack with 30 layers?



Extra Practice

Worksheet PS15

Pages 332-333

Solve each problem using a diagram or model.

1. What solid has a circular edge and only one vertex? *Cone.*
2. A circle fits inside a 2 m square so that it just touches each side of the square. What is the area of the part of the square that is outside the circle? (Use $\pi = 3.14$; see page 106 of the pupil book.) *0.86 m²*
3. How many different 3-digit numerals can be written? *900*
4. A coin is tossed and a die is rolled. What is the probability of obtaining a head and a three? *$\frac{1}{12}$*

Unit 14 Objectives	Test Questions	Pages
A61	1-3	314-315
A62	4-7	316-317
A63	8-11	318-319
A64	12-15	320-321
A65	16-18	322-323
A66	19-21	324-325
A67	22-25	326-327
A68	26-30	328-329
A69	31-34	330-331

TEST

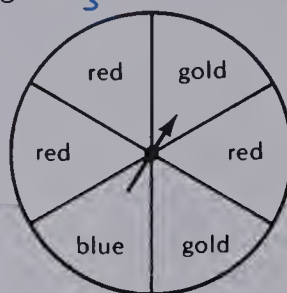
UNIT 14

Add or subtract. Write the answer in simplest terms.

- $\frac{1}{7} + \frac{3}{7} = \frac{4}{7}$
- $\frac{3}{10} + \frac{9}{10} = 1\frac{1}{5}$
- $\frac{3}{50} + \frac{7}{50} = \frac{1}{5}$
- $\frac{1}{12} + \frac{1}{4} = \frac{1}{3}$
- $\frac{2}{5} + \frac{3}{10} = \frac{7}{10}$
- $\frac{7}{8} + \frac{3}{4} = 1\frac{5}{8}$
- $\frac{2}{3} + \frac{1}{9} = \frac{7}{9}$
- $\frac{1}{6} + \frac{4}{5} = \frac{39}{30}$
- $\frac{3}{4} + \frac{7}{10} = 1\frac{9}{20}$
- $\frac{1}{8} + \frac{5}{6} = \frac{23}{24}$
- $\frac{5}{8} + \frac{1}{3} = \frac{23}{24}$
- $7\frac{2}{5} + 2\frac{1}{4} = 9\frac{13}{20}$
- $8\frac{1}{2} + 5\frac{1}{4} = 13\frac{3}{4}$
- $3\frac{7}{12} + 2\frac{1}{5} = 5\frac{47}{60}$
- $4\frac{1}{4} + 5\frac{8}{9} = 10\frac{5}{36}$
- $\frac{6}{7} - \frac{2}{7} = \frac{4}{7}$
- $\frac{11}{12} - \frac{1}{3} = \frac{7}{12}$
- $\frac{2}{3} - \frac{2}{9} = \frac{4}{9}$
- $\frac{5}{6} - \frac{1}{9} = \frac{13}{18}$
- $\frac{5}{6} - \frac{3}{8} = \frac{11}{24}$
- $\frac{3}{7} - \frac{1}{4} = \frac{5}{28}$
- $5\frac{1}{4} - 2\frac{1}{8} = 3\frac{1}{8}$
- $7\frac{2}{3} - 3\frac{2}{9} = 4\frac{4}{9}$
- $6\frac{3}{4} - 1\frac{2}{3} = 5\frac{1}{12}$
- $9\frac{7}{8} - \frac{1}{6} = 9\frac{17}{24}$
- $4\frac{3}{10} - 1\frac{9}{10} = 2\frac{2}{5}$
- $8\frac{1}{12} - 5\frac{5}{12} = 2\frac{2}{3}$
- $7\frac{2}{9} - 3\frac{2}{3} = 3\frac{5}{9}$
- $4\frac{1}{4} - 2\frac{2}{5} = 1\frac{17}{20}$
- $2\frac{2}{3} - \frac{3}{4} = 1\frac{11}{12}$

What is the probability?

- blue $\frac{1}{6}$
- red $\frac{1}{2}$
- gold $\frac{1}{3}$
- green 0



Post-test

Unit 14

Add or subtract. Write the answer in simplest terms.

- $\frac{6}{10} + \frac{3}{10} = \frac{9}{10}$
- $\frac{2}{12} + \frac{7}{12} = \frac{3}{4}$
- $\frac{6}{7} + \frac{5}{7} = 1\frac{1}{7}$
- $\frac{1}{2} + \frac{3}{8} = \frac{7}{8}$
- $\frac{4}{5} + \frac{7}{10} = 1\frac{1}{2}$
- $\frac{3}{7} + \frac{9}{14} = 1\frac{1}{14}$
- $\frac{5}{8} + \frac{7}{16} = 1\frac{1}{16}$
- $\frac{5}{6} + \frac{4}{15} = 1\frac{1}{10}$
- $\frac{7}{10} + \frac{1}{4} = \frac{19}{20}$
- $\frac{3}{4} + \frac{3}{5} = 1\frac{7}{20}$
- $\frac{3}{18} + \frac{11}{12} = 1\frac{1}{2}$
- $5\frac{6}{7} + 1\frac{3}{5} = 7\frac{16}{35}$
- $3\frac{1}{3} + 1\frac{1}{2} = 4\frac{5}{6}$
- $2\frac{3}{5} + 4\frac{2}{3} = 7\frac{4}{15}$
- $4\frac{7}{9} + 10\frac{5}{6} = 15\frac{11}{18}$
- $\frac{11}{12} - \frac{1}{4} = \frac{2}{3}$
- $\frac{15}{20} - \frac{1}{5} = \frac{11}{20}$
- $\frac{2}{3} - \frac{11}{24} = \frac{5}{24}$

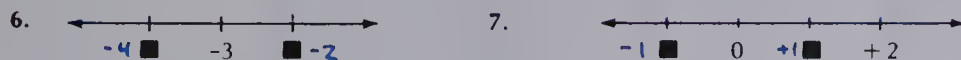
Copy and complete the pattern. State the rule.

1. (1, 2) (2, 4) (3, 6) (4, 8) $(\overset{5}{\blacksquare}, \overset{10}{\blacksquare})$ $(\overset{6}{\blacksquare}, \overset{12}{\blacksquare}) \times 2$
2. (1, 6) (2, 7) (3, 8) (4, 9) $(\overset{5}{\blacksquare}, \overset{10}{\blacksquare})$ $(\overset{6}{\blacksquare}, \overset{11}{\blacksquare}) + 5$

Which temperature is higher?

3. 7°C or 0°C
4. -8°C or 3°C
5. -9°C or -2°C

Copy. Fill in the missing integers.



Copy and complete using $>$ or $<$.

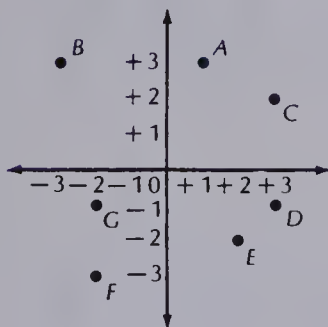
8. $-2 \bullet -4$
9. $+11 \bullet +1$
10. $-6 \bullet +3$

Name the point for the ordered pair.

11. $(-3, +3)$ **B**
12. $(+3, -1)$ **D**

Write the ordered pair for the point.

13. A **$(+1, +3)$**
14. G **$(-2, -1)$**



Name the corresponding angles in these similar triangles.

- 15.
- 16.

Solve.

17. A drawing is 4 cm long. The scale ratio is 1:5.
How long is the real object? **20 cm**
18. A drawing is 2 cm tall. The scale ratio is 1:6.
How tall is the real object? **12 cm**

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19. $\frac{7}{12} - \frac{2}{9} = \frac{13}{36}$
20. $\frac{6}{7} - \frac{3}{5} = \frac{9}{35}$
21. $\frac{11}{15} - \frac{1}{6} = \frac{17}{30}$
22. $5\frac{3}{4} - 2\frac{1}{2} = 3\frac{1}{4}$
23. $8\frac{7}{8} - 6\frac{2}{3} = 2\frac{5}{24}$
24. $3\frac{5}{9} - 2\frac{1}{6} = 1\frac{7}{18}$
25. $5\frac{11}{12} - 2\frac{3}{8} = 3\frac{13}{24}$
26. $4\frac{1}{3} - 2\frac{5}{6} = 1\frac{1}{2}$
27. $10\frac{3}{5} - 6\frac{9}{10} = 3\frac{7}{10}$
28. $16\frac{1}{6} - 5\frac{7}{9} = 10\frac{7}{18}$
29. $10\frac{3}{4} - 7\frac{6}{7} = 2\frac{25}{28}$
30. $7\frac{1}{12} - 1\frac{7}{18} = 5\frac{25}{36}$

There are 2 red blocks, 1 orange block, 1 yellow block, 2 blue blocks, 1 green block, and 3 black blocks in a bag. A block is picked without looking. What is the probability the block will be:

31. black **$\frac{3}{10}$**
32. brown **0**
33. red or blue **$\frac{2}{5}$**
34. red, yellow or black? **$\frac{7}{10}$**

Cumulative Test

UNITS 1-4

Write in standard form.

1. $4000 + 700 + 5 + 0.6 + 0.09$ 4705.69
2. $80\,000\,000 + 200\,000 + 10\,000 + 400 + 60 + 9$ 80 210 469
3. Sixty seven and nine hundred sixteen ten thousandths 67.0916

Copy and complete. Use $<$, $=$, or $>$.

4. 43 592 610 ● 43 592 601
5. 890 247 634 119 ● 980 247 634 119
6. 60.158 ● 60.185
7. 309.1658 ● 310.9658

Round.

8. 294 501 638 to the nearest thousand **294 502 000**
9. 314.9708 to the nearest hundredth **314.97**

Write in expanded form.

10. 7 362 045 11. 0.819 12. 5021.93
- 7 000 000 + 300 000 + 60 000 8 tenths + 1 hundredth 5000 + 20 + 1
- + 2000 + 40 + 5 + 9 thousandths + 0.9 + .03
- Add or subtract.

- $$\begin{array}{r}
 13. \quad 254 \\
 + 76 \\
 \hline
 330
 \end{array}
 \qquad
 \begin{array}{r}
 14. \quad 695 \\
 + 807 \\
 \hline
 1502
 \end{array}
 \qquad
 \begin{array}{r}
 15. \quad \$5.95 \\
 + 8.27 \\
 \hline
 \$14.22
 \end{array}
 \qquad
 \begin{array}{r}
 16. \quad 4.9 \\
 + 8.3 \\
 \hline
 13.2
 \end{array}
 \qquad
 \begin{array}{r}
 17. \quad 18.73 \\
 + 7.28 \\
 \hline
 26.01
 \end{array}$$

- | | | | | | | | | | |
|-----|-------------|-----|--------------|-----|--------------|-----|---------------|-----|---------------|
| 18. | 94 | 19. | 500 | 20. | 3074 | 21. | 8526 | 22. | \$8.17 |
| | <u>- 38</u> | | <u>- 213</u> | | <u>- 516</u> | | <u>- 4709</u> | | <u>- 4.59</u> |
| | 56 | | 287 | | 2558 | | 387 | | \$3.58 |

- | | | | | | | | |
|-----|---------------|-----|----------------|-----|--------------|-----|--------------|
| 23. | 4 206 | 24. | \$13.24 | 25. | 0.12 | 26. | 15.26 |
| | 27 184 | | 6.58 | | 0.8 | | 8.1 |
| | + 391 | | + 27.09 | | + 0.375 | | + 37.08 |
| | <u>31 781</u> | | <u>\$46.91</u> | | <u>1.295</u> | | <u>60.44</u> |

- | | | | | | | | |
|-----|----------------|-----|-------------|-----|-------------|-----|--------------|
| 27. | \$40.02 | 28. | 50.4 | 29. | 0.2 | 30. | 3.43 |
| | - 23.15 | | - 27.6 | | - 0.13 | | - 0.852 |
| | <u>\$16.87</u> | | <u>22.8</u> | | <u>0.07</u> | | <u>2.578</u> |

Copy and complete.

31. $7^2 = \blacksquare \times \blacksquare$ 7
 $= \blacksquare \times \blacksquare$ 49

Multiply.

- | | | | | | | | | | | | | | | | | | | | |
|-----|-----|--------------|---------------|-----|-----|--------------|----------------|-----|------|--------------|-----------------|-----|---------|-------------|-----------------|-----|---------|---------------|------------------|
| 33. | 35 | $\times 9$ | <u>315</u> | 34. | 605 | $\times 8$ | <u>4840</u> | 35. | 147 | $\times 3$ | <u>441</u> | 36. | 2940 | $\times 6$ | <u>17 640</u> | 37. | 6250 | $\times 7$ | <u>43 750</u> |
| 38. | 23 | $\times 48$ | <u>1104</u> | 39. | 45 | $\times 79$ | <u>3555</u> | 40. | 591 | $\times 64$ | <u>37 824</u> | 41. | 208 | $\times 56$ | <u>11 648</u> | 42. | 700 | $\times 80$ | <u>56 000</u> |
| 43. | 141 | $\times 236$ | <u>33 276</u> | 44. | 387 | $\times 592$ | <u>229 104</u> | 45. | 400 | $\times 76$ | <u>30 400</u> | 46. | \$91.54 | $\times 8$ | <u>\$732.32</u> | 47. | \$362.2 | $\times 4$ | <u>\$14 852.</u> |
| 48. | 5.3 | $\times 4$ | <u>21.2</u> | 49. | 47 | $\times 3.2$ | <u>150.4</u> | 50. | 64.2 | $\times 813$ | <u>52 194.6</u> | 51. | 5.12 | $\times 6$ | <u>30.72</u> | 52. | 277 | $\times 0.15$ | <u>41.55</u> |

Divide:

- | | | | | |
|---------|-----------------------------------|---------------------------------------|-------------------------------------|---|
| Divide: | $\frac{12}{8 \overline{)96}}$ | $\frac{24}{5 \overline{)120}}$ | $\frac{49.5}{6 \overline{)297}}$ | $\frac{260.6}{3 \overline{)782}}$ |
| 53. | | 54. | 55. | 56. |
| 57. | $\frac{1005}{9 \overline{)9045}}$ | 58. | 59. | 60. |
| | | $\frac{902.143}{7 \overline{)6315}}$ | $\frac{15}{20 \overline{)300}}$ | $\frac{2.08\bar{3}}{36 \overline{)75}}$ |
| 61. | $\frac{66}{42 \overline{)2772}}$ | 62. | 63. | 64. |
| | | $\frac{130.941}{68 \overline{)8904}}$ | $\frac{1192}{25 \overline{)29800}}$ | $\frac{350}{40 \overline{)14000}}$ |
| 65. | $\frac{307}{16 \overline{)4912}}$ | 66. | 67. | |
| | | $\frac{16.588}{51 \overline{)846}}$ | $\frac{804}{13 \overline{)10452}}$ | |

Solve:

68. Shares of Nugget Mines are trading at \$8.75 a share. What is the cost of 200 shares? **\$1750.00**
69. Fred's heart beats 4380 times in 1 h. How many times does it beat each minute? **73**

Cumulative Test

UNITS 5-8

Find the perimeter.

- 2 m, 3 m, 3 m, 3 m, 3 m
- 3 m, 5 m, 6 m, 3 m
- 6 cm, 12 cm, 6 cm
- 5 km, 12 km, 13 km

Calculate the circumference of a circle with each diameter.

- 12 cm
- 41 mm
- 18 m
- 200 km

Calculate the area of a circle with each radius.

- 5 cm
- 7 mm
- 13 m
- 24 cm

Calculate the volume of the box.

- $L = 5$ cm, $W = 4$ cm, $H = 4$ cm
- $L = 8$ m, $W = 3$ m, $H = 5$ m

Copy and complete.

- 6000 kg = \square t
- 7 L = \square mL
- 8000 L = \square kL
- The mass of 3 L of water is \square kg
- From 08:00 to 13:00 is \square h.

List the first five multiples for each number. Find the LCM.

- 4 and 5
- 6 and 8
- 3 and 7

List the factors for each number. Find the GCF.

- 21 and 24
- 12 and 18
- 10 and 20

Make a factor tree to express each number as a product of prime factors. Write the product using exponents.

- 24
- 30
- 48

Copy and simplify each expression.

- $5 \times 9 - 3$
- $6 \times 8 + 10 \div 5$
- $(5 + 3) \div 2^2$

Solve for N. Check.

- $N + 50 = 82$
- $N - 33 = 66$
- $N \div 50 = 5$

Copy and complete.

- $\frac{2}{3} = \frac{4}{6}$
- $\frac{1}{3} = \frac{\square}{9} = \frac{\square}{15}$
- $\frac{6}{10} = \frac{3}{\square}$

Write in simplest terms.

- $\frac{3}{6}$
- $\frac{2}{8}$
- $\frac{5}{15}$
- $\frac{4}{10}$
- $\frac{11}{22}$

Copy and complete. Use $<$ or $>$.

- $\frac{1}{2} \bullet \frac{3}{4}$
- $\frac{3}{4} \bullet \frac{3}{5}$
- $\frac{2}{3} \bullet \frac{4}{5}$

Write as a fraction.

- $4\frac{1}{3}$
- $2\frac{5}{8}$
- $2\frac{1}{8}$

Write as a mixed numeral.

- $\frac{15}{2}$
- $\frac{36}{10}$
- $\frac{3}{5}$

Write as a decimal.

- $\frac{8}{10}$
- $\frac{38}{100}$
- $\frac{16}{25}$
- $\frac{1}{50}$

Multiply. Write the answer in simplest terms.

- $\frac{1}{5} \times 10$
- $\frac{3}{10} \times 20$
- $\frac{2}{3} \times 18$

3. $\frac{3}{4} \times 14$

- $\frac{2}{3} \times \frac{5}{6}$
- $\frac{3}{4} \times \frac{1}{5}$
- $\frac{5}{8} \times \frac{3}{7}$

63. $8 \times 2\frac{1}{2}$

- $\frac{1}{3} \times 1\frac{1}{2}$
- $3\frac{1}{4} \times \frac{2}{5}$

Find the product.

- 4.7×15
- 8.15×42
- $68. \times 0.5$

70. 0.08×0.3

- 0.27×0.6
- 0.162×5.5
- 18.755×6.7

53.801

Cumulative Test

UNITS 9-11

Solve.

- 4 kg cost \$14.52. What does 1 kg cost? **37.63**
- 1 box costs \$3.55. What do 5 boxes cost? **\$17.75**
- A bus went 125 km in 2 h. How far will it go in 6 h? **375 km**

Use these figures to write the ratio.

- $\bigcirc \bigcirc \bigcirc$ $\triangle \triangle \triangle \triangle \triangle$ $\square \square \square$
 4. squares to circles **2:3** 5. triangles to squares **5:2**
 6. circles to triangles **3:5** 7. triangles to circles **5:3**

Solve for N.

$$8. \frac{3}{5} = \frac{9}{N} \quad 15 \quad 9. \frac{2}{3} = \frac{N}{15} \quad 10. \frac{N}{8} = \frac{1}{4} \quad 2 \quad 11. \frac{4}{N} = \frac{24}{30} \quad 5$$

Copy and complete the chart.

Fraction	Decimal	Percent
$\frac{2}{5}$	0.4	40%
$\frac{13}{100}$	0.13	13%
$\frac{13}{20}$	0.65	65%

Calculate.

- 23% of 400 **92** 16. 10% of 20 **2** 17. 40% of \$50 **\$20**

Write the reciprocal of each.

- $\frac{1}{2}$ **2** 19. $\frac{5}{4}$ **$\frac{4}{5}$** 20. $2\frac{2}{3}$ **$\frac{3}{8}$** 21. $9\frac{1}{9}$

Divide.

- $\frac{3}{10} \div 2$ **$\frac{3}{20}$** 23. $\frac{1}{2} \div 5$ **$\frac{1}{10}$** 24. $8 \div \frac{1}{4}$ **32** 25. $\frac{2}{3} \div \frac{1}{5}$ **$3\frac{1}{3}$**
- $12 \div \frac{1}{2}$ **24** 27. $\frac{2}{3} \div \frac{9}{10}$ **$\frac{20}{27}$** 28. $3 \div \frac{5}{6}$ **$3\frac{3}{5}$** 29. $4\frac{1}{5} \div \frac{7}{8}$ **$4\frac{4}{5}$**
- $3 \div 0.9$ **$\frac{0.3}{0.9}$** 31. $5 \div 21.5$ **$\frac{4.3}{21.5}$** 32. $8 \div 6.16$ **$\frac{0.77}{6.16}$** 33. $0.4 \div \frac{120}{48}$

- $0.2 \overline{)0.36}$ **$\frac{1.8}{0.36}$** 35. $3.1 \overline{)0.062}$ **$\frac{0.02}{0.062}$** 36. $4.4 \overline{)0.18}$ **$\frac{1.2}{0.18}$** 37. $0.06 \overline{)0.18}$ **$\frac{3}{0.18}$**
- $0.06 \overline{)0.522}$ **$\frac{8.7}{0.522}$** 39. $0.07 \overline{)8.4}$ **$\frac{120}{8.4}$** 40. $0.12 \overline{)6.00}$ **$\frac{50}{6.00}$** 41. $0.8 \overline{)5.68}$ **$\frac{7.1}{5.68}$**

Divide. Round the quotient to the nearest hundredth.

- $9 \overline{)8.8}$ **$\frac{0.98}{8.8}$** 43. $6 \overline{)4}$ **$\frac{0.67}{4}$** 44. $0.3 \overline{)4.9}$ **$\frac{16.33}{4.9}$** 45. $7.1 \overline{)0.48}$ **$\frac{0.07}{0.48}$**

Express each fraction as a decimal. Divide until the remainder is zero.

- $\frac{3}{8}$ **0.375** 47. $\frac{67}{50}$ **1.34** 48. $\frac{2}{5}$ **0.4** 49. $\frac{13}{25}$ **0.52**

What are the range, mode, mean, and median of each set of numbers?

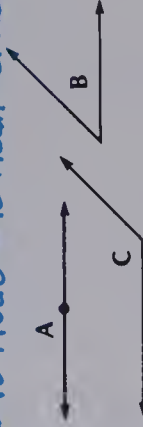
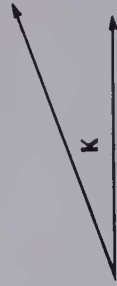
Round the mean to the nearest whole number.

- 25, 12, 27, 19, 27, 34, 32 **R=22 Mode=27 Mean=25 Median=27**
- 10, 20, 20, 30, 40, 40, 40, 50 **Range=40 Mode=40 Mean=35 Median=35**

Which angle is an obtuse angle? **C**

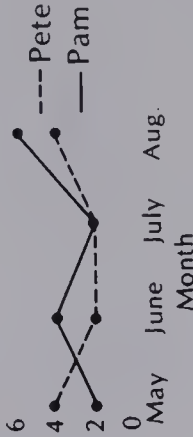
Which angle is a straight angle? **A**

Which angle below measures 10° ? **J**



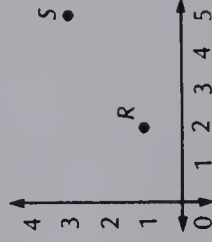
Savings

- How much did Pam save in June? **\$4**
- Who saved more in August? **Pam**
- In what month did they both save the same amount? **July**



Write the ordered pair for the point.

- R **(2,1)** 59. S **(5,3)**



Construct a circle graph to show the information.

- Rita had \$12 to spend at the carnival. She spent \$6 on rides, \$4 on refreshments, and \$2 on a hat.

Addition

1.	328	2.	83	3.	915	4.	65	5.	999
	+ 94		+ 451		+ 36		+ 847		+ 99
	<u>422</u>		<u>534</u>		<u>951</u>		<u>912</u>		<u>1098</u>
6.	426	7.	948	8.	500	9.	218	10.	464
	+ 105		+ 373		+ 800		+ 793		+ 464
	<u>531</u>		<u>1321</u>		<u>1300</u>		<u>1011</u>		<u>928</u>
11.	231	12.	407	13.	301	14.	58	15.	607
	864		136		56		249		8
	+ 795		+ 291		+ 249		+ 5		+ 36
	<u>1890</u>		<u>834</u>		<u>606</u>		<u>312</u>		<u>651</u>
16.	560 + 24	17.	209 + 470	18.	403 + 65	19.	678		
	<u>584</u>		<u>679</u>		<u>465</u>		<u>743</u>		
19.	5538	20.	8006	21.	516	22.	3078	23.	1494
	+ 3162		+ 4127		+ 4922		+ 953		+ 3027
	<u>8700</u>		<u>12133</u>		<u>5438</u>		<u>4031</u>		<u>4521</u>
24.	46 697	25.	75 092	26.	34 582	27.	6 285		
	+ 20 810		+ 6 813		+ 17 649		+ 24 139		
	<u>67 507</u>		<u>81 905</u>		<u>52 231</u>		<u>30 424</u>		
28.	29	29.	143	30.	294	31.	438		
	87		269		18		9		
	54		580		75		65		
	+ 32		+ 372		+ 103		+ 702		
	<u>202</u>		<u>1364</u>		<u>490</u>		<u>1214</u>		
32.	27	33.	604	34.	37 306	35.	18		
	9		5		8		4 092		
	14		83		291		375		
	3		219		52		26 153		
	+ 81		+ 70		+ 4 815		+ 1		
	<u>134</u>		<u>981</u>		<u>42 472</u>		<u>30 639</u>		
36.	\$24.95	37.	\$54.75	38.	\$ 6.15	39.	\$62.93		
	+ 13.72		+ 8.66		+ 93.85		+ 40.07		
	<u>\$ 38.67</u>		<u>\$ 63.41</u>		<u>\$ 100.00</u>		<u>\$ 103.00</u>		

Subtraction

Subtract.

1.	53	2.	71	3.	60	4.	92	5.	80
	- 28		- 14		- 29		- 43		- 35
	<u>25</u>		<u>57</u>		<u>31</u>		<u>49</u>		<u>45</u>
6.	824	7.	200	8.	507	9.	591	10.	500
	- 76		- 55		- 32		- 98		- 16
	<u>748</u>		<u>145</u>		<u>475</u>		<u>493</u>		<u>484</u>
11.	410	12.	953	13.	821	14.	805	15.	700
	- 169		- 487		- 463		- 316		- 282
	<u>241</u>		<u>466</u>		<u>358</u>		<u>489</u>		<u>418</u>
16.	90 - 35	17.	648 - 399	18.	500 - 246				
	<u>55</u>		<u>249</u>		<u>254</u>				
19.	4631	20.	1800	21.	5920	22.	4096	23.	3546
	- 852		- 372		- 664		- 587		- 273
	<u>3779</u>		<u>1428</u>		<u>5256</u>		<u>3509</u>		<u>3273</u>
24.	5110	25.	4000	26.	8295	27.	3146	28.	9020
	- 2734		- 1365		- 6497		- 1158		- 2161
	<u>2376</u>		<u>2635</u>		<u>1798</u>		<u>1988</u>		<u>6859</u>
29.	63 102	30.	29 064	31.	77 156	32.	98 412		
	- 5 843		- 1 958		- 4 829		- 3 690		
	<u>57 259</u>		<u>27 106</u>		<u>72 327</u>		<u>94 722</u>		
33.	26 541	34.	90 000	35.	30 927	36.	56 284		
	- 19 783		- 72 068		- 19 473		- 31 747		
	<u>6758</u>		<u>17 932</u>		<u>11 454</u>		<u>24 537</u>		
37.	\$52.19	38.	\$69.98	39.	\$80.00	40.	\$125.08		
	- 34.50		- 49.99		- 17.23		- 62.39		
	<u>\$ 17.69</u>		<u>\$ 19.99</u>		<u>\$ 62.77</u>		<u>\$ 62.69</u>		
41.	\$371.26	42.	\$586.42	43.	\$231.00	44.	\$438.51		
	- 34.88		- 297.69		- 154.14		- 169.75		
	<u>\$ 336.38</u>		<u>\$ 288.73</u>		<u>\$ 76.86</u>		<u>\$ 268.76</u>		

Multiplication

Multiply.

1. 4×9 **36** 2. 8×5 **40** 3. 60×4 **240** 4. 30×7 **210**
5. 75×2 **150** 6. 61×6 **366** 7. 56×7 **392** 8. 95×5 **475** 9. 34×8 **272**
10. 451×8 **3608** 11. 207×9 **1863** 12. 392×5 **1960** 13. 500×9 **4500** 14. 216×8 **1728**
15. 7684×3 **23 052** 16. 5080×4 **20 320** 17. 4157×6 **24 942** 18. 3291×7 **23 037** 19. 6004×9 **54 036**
20. 45×38 **1710** 21. 72×61 **4392** 22. 29×50 **1450** 23. 82×69 **5658** 24. 65×73 **4745**
25. 208×48 **9984** 26. 615×93 **57 195** 27. 759×26 **19 734** 28. 438×30 **13 140** 29. 691×57 **39 387**
30. 267×34 **9078** 31. 514×65 **33 410** 32. 809×18 **14 562** 33. 400×30 **12 000** 34. 748×29 **21 692**
35. 358×262 **93 796** 36. 941×703 **661 523** 37. 536×418 **224 048** 38. 369×840 **309 960** 39. 132×565 **74 580**
40. 200×500 **100 000** 41. 139×482 **66 998** 42. 801×700 **560 700** 43. 348×395 **137 460** 44. 614×253 **155 342**
45. $\$62.50 \times 3$ **\\$187.50** 46. $\$129.95 \times 7$ **\\$909.65** 47. $\$24.89 \times 15$ **\\$373.35** 48. $\$146.74 \times 29$ **\\$4255.46**
49. $4 \times 4 \times 4 \times 4$ **256** 50. $2 \times 2 \times 2 \times 2 \times 2$ **32** 51. $6 \times 6 \times 6$ **216**

Division

Divide.

1. $54 \div 9$ **6** 2. $40 \div 5$ **8** 3. $63 \div 7$ **9** 4. $28 \div 4$ **7**
5. $6 \overline{)75}$ **12.5** 6. $8 \overline{)725}$ **90.625** 7. $3 \overline{)22}$ **7.33** 8. $9 \overline{)73}$ **8.111** 9. $7 \overline{)32}$ **4.571**
10. $164 \div 44$ **3.727** 11. $384 \div 664$ **0.578** 12. $802 \div 240$ **3.342** 13. $270 \div 554$ **0.489**
14. $8 \overline{)544}$ **68** 15. $4 \overline{)200}$ **50** 16. $3 \overline{)249}$ **83** 17. $7 \overline{)651}$ **93** 18. $5 \overline{)605}$ **121**
19. $9 \overline{)482}$ **53.5** 20. $3 \overline{)704}$ **234.6** 21. $7 \overline{)395}$ **56.429** 22. $4 \overline{)646}$ **161.5** 23. $8 \overline{)267}$ **33.375**
24. $6 \overline{)1482}$ **247** 25. $2 \overline{)5934}$ **2967** 26. $5 \overline{)3050}$ **610** 27. $9 \overline{)9144}$ **1016** 28. $4 \overline{)3172}$ **793**
29. $8 \overline{)7025}$ **878.125** 30. $3 \overline{)3914}$ **1304.6** 31. $7 \overline{)8602}$ **1228.857** 32. $5 \overline{)1693}$ **338.6** 33. $9 \overline{)8745}$ **971.6**

Division

Divide.

1. $60 \overline{)12}$ **0.2** 2. $20 \overline{)595}$ **29.75** 3. $90 \overline{)2583}$ **28.7** 4. $10 \overline{)6410}$ **641** 5. $40 \overline{)4392}$ **109.8**
6. $23 \overline{)21}$ **0.913** 7. $41 \overline{)18}$ **0.439** 8. $60 \overline{)15}$ **0.25** 9. $18 \overline{)972}$ **54** 10. $35 \overline{)875}$ **25**
11. $90 \overline{)6.6}$ **0.073** 12. $52 \overline{)17.658}$ **0.3396** 13. $83 \overline{)769}$ **9.265** 14. $74 \overline{)840}$ **11.351** 15. $17 \overline{)321}$ **18.882**
16. $33 \overline{)51}$ **1.545** 17. $66 \overline{)1518}$ **22.864** 18. $29 \overline{)1682}$ **58** 19. $19 \overline{)1862}$ **98**
20. $43 \overline{)82}$ **1.907** 21. $24 \overline{)72.417}$ **3.017375** 22. $93 \overline{)103.312}$ **1.111** 23. $52 \overline{)124.635}$ **2.39683**
24. $80 \overline{)50.75}$ **0.6344** 25. $76 \overline{)4913}$ **64.645** 26. $41 \overline{)23821}$ **581** 27. $28 \overline{)56868}$ **2031**
28. $64 \overline{)875}$ **13.672** 29. $37 \overline{)3740}$ **101.081** 30. $55 \overline{)37345}$ **679** 31. $94 \overline{)82395}$ **876.543**
32. $15 \overline{)2456.067}$ **163.738** 33. $71 \overline{)95624}$ **1346.817** 34. $83 \overline{)64722}$ **779.793** 35. $30 \overline{)35060}$ **1168.6**

Addition

Add.

1. $\begin{array}{r} \$4.36 \\ + 2.95 \\ \hline \$7.31 \end{array}$
2. $\begin{array}{r} \$37.49 \\ + 5.81 \\ \hline \$43.30 \end{array}$
3. $\begin{array}{r} \$8.50 \\ + 6.29 \\ \hline \$14.79 \end{array}$
4. $\begin{array}{r} \$40.20 \\ + 9.98 \\ \hline \$50.18 \end{array}$
5. $\begin{array}{r} \$12.53 \\ + 48.76 \\ \hline \$61.29 \end{array}$
6. $\begin{array}{r} 1.6 \\ + 5.3 \\ \hline 6.9 \end{array}$
7. $\begin{array}{r} 5.9 \\ + 8.3 \\ \hline 14.2 \end{array}$
8. $\begin{array}{r} 7.5 \\ + 6.7 \\ \hline 14.2 \end{array}$
9. $\begin{array}{r} 6.17 \\ + 4.0 \\ \hline 10.17 \end{array}$
10. $\begin{array}{r} 9.43 \\ + 2.58 \\ \hline 12.01 \end{array}$
11. $\begin{array}{r} 14.02 + 3.55 \\ 17.57 \end{array}$
12. $\begin{array}{r} 60 + 0.51 + 3.18 \\ 63.69 \end{array}$
13. $\begin{array}{r} 27.6 + 19.3 + 41.208 \\ 88.108 \end{array}$
14. $\begin{array}{r} 23.148 \\ + 6.75 \\ \hline 29.898 \end{array}$
15. $\begin{array}{r} 50.42 \\ 0.681 \\ + 3.7 \\ \hline 54.801 \end{array}$
16. $\begin{array}{r} 28.974 \\ 13.506 \\ + 42.015 \\ \hline 84.495 \end{array}$
17. $\begin{array}{r} 4.0 \\ 62.018 \\ + 45.79 \\ \hline 111.808 \end{array}$
18. $\begin{array}{r} 3.4 \\ 0.9 \\ 1.2 \\ + 5.6 \\ \hline 11.1 \end{array}$
19. $\begin{array}{r} 8.03 \\ 42.5 \\ 16.97 \\ + 2.18 \\ \hline 69.68 \end{array}$
20. $\begin{array}{r} 23.17 \\ 4.09 \\ 60.34 \\ + 58.26 \\ \hline 145.86 \end{array}$
21. $\begin{array}{r} 0.39 \\ 62.05 \\ 14.87 \\ + 3.54 \\ \hline 80.85 \end{array}$

Multiplication

Multiply.

1. $\begin{array}{r} 47 \\ \times 0.5 \\ \hline 23.5 \end{array}$
2. $\begin{array}{r} 125 \\ \times 0.2 \\ \hline 25 \end{array}$
3. $\begin{array}{r} 850 \\ \times 0.3 \\ \hline 255 \end{array}$
4. $\begin{array}{r} 27 \\ \times 0.15 \\ \hline 4.05 \end{array}$
5. $\begin{array}{r} 35 \\ \times 0.25 \\ \hline 8.75 \end{array}$
6. $\begin{array}{r} 325 \\ \times 0.33 \\ \hline 107.25 \end{array}$
7. $\begin{array}{r} 0.7 \\ \times 8 \\ \hline 5.6 \end{array}$
8. $\begin{array}{r} 0.5 \\ \times 12 \\ \hline 6.0 \end{array}$
9. $\begin{array}{r} 0.38 \\ \times 4 \\ \hline 1.52 \end{array}$
10. $\begin{array}{r} 0.49 \\ \times 29 \\ \hline 14.21 \end{array}$
11. $\begin{array}{r} 3.7 \\ \times 6 \\ \hline 22.2 \end{array}$
12. $\begin{array}{r} 4.02 \\ \times 18 \\ \hline 72.36 \end{array}$
13. $\begin{array}{r} 0.2 \\ \times 0.9 \\ \hline 0.18 \end{array}$
14. $\begin{array}{r} 0.8 \\ \times 0.7 \\ \hline 0.56 \end{array}$
15. $\begin{array}{r} 3.5 \\ \times 0.8 \\ \hline 2.8 \end{array}$
16. $\begin{array}{r} 63.7 \\ \times 0.4 \\ \hline 25.48 \end{array}$
17. $\begin{array}{r} 19.5 \\ \times 3.8 \\ \hline 74.1 \end{array}$
18. $\begin{array}{r} 67.4 \\ \times 32.5 \\ \hline 2190.50 \end{array}$
19. $\begin{array}{r} 0.6 \\ \times 7.2 \\ \hline 4.32 \end{array}$
20. $\begin{array}{r} 0.05 \\ \times 0.3 \\ \hline 0.015 \end{array}$
21. $\begin{array}{r} 0.16 \\ \times 0.2 \\ \hline 0.032 \end{array}$
22. $\begin{array}{r} 0.38 \\ \times 4.9 \\ \hline 1.862 \end{array}$
23. $\begin{array}{r} 0.19 \\ \times 6.3 \\ \hline 1.197 \end{array}$
24. $\begin{array}{r} 4.92 \\ \times 7.5 \\ \hline 36.9 \end{array}$
25. $\begin{array}{r} 73.42 \\ \times 5.8 \\ \hline 425.836 \end{array}$

Subtraction

Subtract.

1. $\begin{array}{r} 7.1 \\ - 4.0 \\ \hline 3.1 \end{array}$
2. $\begin{array}{r} 5.7 \\ - 2.9 \\ \hline 2.8 \end{array}$
3. $\begin{array}{r} 8.0 \\ - 3.4 \\ \hline 4.6 \end{array}$
4. $\begin{array}{r} 8.2 \\ - 3.9 \\ \hline 4.3 \end{array}$
5. $\begin{array}{r} 4.3 \\ - 1.7 \\ \hline 2.6 \end{array}$
6. $\begin{array}{r} 72.46 \\ - 11.05 \\ \hline 61.41 \end{array}$
7. $\begin{array}{r} 37.64 \\ - 18.95 \\ \hline 18.69 \end{array}$
8. $\begin{array}{r} 43.1 \\ - 19.62 \\ \hline 23.48 \end{array}$
9. $\begin{array}{r} 50.01 \\ - 29.43 \\ \hline 20.58 \end{array}$
10. $\begin{array}{r} 54.81 \\ - 46.92 \\ \hline 7.89 \end{array}$
11. $\begin{array}{r} 8.153 \\ - 4.296 \\ \hline 3.857 \end{array}$
12. $\begin{array}{r} 5.463 \\ - 1.785 \\ \hline 3.678 \end{array}$
13. $\begin{array}{r} 9.608 \\ - 4.519 \\ \hline 5.089 \end{array}$
14. $\begin{array}{r} 9.0 \\ - 2.487 \\ \hline 6.513 \end{array}$
15. $\begin{array}{r} 5.2 \\ - 1.843 \\ \hline 3.357 \end{array}$
16. $\begin{array}{r} 0.358 \\ - 0.109 \\ \hline 0.249 \end{array}$
17. $\begin{array}{r} 0.063 \\ - 0.057 \\ \hline 0.006 \end{array}$
18. $\begin{array}{r} 0.004 \\ - 0.001 \\ \hline 0.003 \end{array}$
19. $\begin{array}{r} 0.506 \\ - 0.029 \\ \hline 0.477 \end{array}$
20. $\begin{array}{r} 0.01 \\ - 0.007 \\ \hline 0.003 \end{array}$

Division

Divide.

1. $\begin{array}{r} 1.2 \\ 6 \overline{)7.2} \end{array}$
2. $\begin{array}{r} 0.08 \\ 4 \overline{)0.32} \end{array}$
3. $\begin{array}{r} 0.129 \\ 2 \overline{)0.258} \end{array}$
4. $\begin{array}{r} 0.301 \\ 3 \overline{)0.906} \end{array}$
5. $\begin{array}{r} 1.38 \\ 5 \overline{)6.9} \end{array}$
6. $\begin{array}{r} 0.525 \\ 4 \overline{)2.1} \end{array}$
7. $\begin{array}{r} 0.608 \\ 25 \overline{)15.2} \end{array}$
8. $\begin{array}{r} 5.6 \\ 10 \overline{)56} \end{array}$
9. $\begin{array}{r} 30 \\ 0.3 \overline{)9} \end{array}$
10. $\begin{array}{r} 3 \\ 0.2 \overline{)0.6} \end{array}$
11. $\begin{array}{r} 70 \\ 0.5 \overline{)35} \end{array}$
12. $\begin{array}{r} 0.03 \\ 0.7 \overline{)0.021} \end{array}$
13. $\begin{array}{r} 29 \\ 3.1 \overline{)89.9} \end{array}$
14. $\begin{array}{r} 0.4 \\ 2.7 \overline{)1.08} \end{array}$
15. $\begin{array}{r} 0.05 \\ 3.6 \overline{)0.18} \end{array}$
16. $\begin{array}{r} 2 \\ 1.25 \overline{)2.5} \end{array}$
17. $\begin{array}{r} 5.3 \\ 0.05 \overline{)0.265} \end{array}$
18. $\begin{array}{r} 130 \\ 0.12 \overline{)15.6} \end{array}$
19. $\begin{array}{r} 2 \\ 1.25 \overline{)2.5} \end{array}$
20. $\begin{array}{r} 30 \\ 1.86 \overline{)55.8} \end{array}$

Divide. Round the quotient to the nearest hundredth.

21. $\begin{array}{r} 0.14 \\ 7 \overline{)1} \end{array}$
22. $\begin{array}{r} 46.67 \\ 0.3 \overline{)14} \end{array}$
23. $\begin{array}{r} 0.23 \\ 1.5 \overline{)0.35} \end{array}$
24. $\begin{array}{r} 16.94 \\ 0.36 \overline{)6.1} \end{array}$

Word Problems

Solve.

- In the 1980-81 crop year, Canada exported the following number of million tonnes of grain: West Coast ports, 9.564; Churchill, 0.289; Thunder Bay, 10.465; Atlantic ports, 0.73. How many million tonnes of grain did Canada export in 1980-81? **21.048**
- Let $a = 1$, $b = 2$, $c = 3$, $d = 4$, and so on. Find the sum of the letters in the word "examination". **125**
- An airline advertised a special return fare of \$357.50 from Edmonton to Montreal. The regular fare is \$577.50. How much will 2 adults save by taking advantage of the cheaper fare? **\$440**
- A trust company paid $19\frac{3}{4}\%$ interest on a one-year deposit of \$5000.00. What was the amount of interest paid for the year? **\$987.50**
- In the North American Soccer League, the Vancouver Whitecaps had 168 points after 30 games. What was the average number of points per game? **5.6**
- Grain exports through the port of Churchill were 0.523 million tonnes in 1979-80 and 0.289 million tonnes in 1980-81. How many more million tonnes were shipped in 1979-80 than in 1980-81? **0.234**
- The Toronto Stock Exchange Index closed at 2334.33 points on Thursday and 2310.61 points on Friday. How many points down from Thursday was the Friday index? **23.72**
- An airplane leaves Calgary at 13:05 and arrives in Toronto at 18:30. There is a 2 h time difference between Calgary and Toronto. How long is the flight? **3 h 25 min**
- A 24-can case of juice costs \$10.08. The juice regularly sells at 2 cans for \$0.89. How much money is saved by buying the case? **\$0.60**

- A group of students collected pennies for their favourite charity. The first day they collected 3 pennies. Each day they collected 3 times as many as the day before.
 - How many pennies did they collect on the fifth day? **243**
 - How much money did they collect in all five days? **363**
- The Nile river is 6632 km long. The St. Lawrence river is 3440 km long. How much longer than the St. Lawrence is the Nile? **3192 km**
- An elevator in a Paris apartment building was installed in 1883. How long has the elevator been in operation? **99 years**
- The price of a tire for the Langleys' car was \$53.45. How much would a set of 4 tires cost? **\$213.80**
- A student whose mass is 32 kg on Earth would have a mass of approximately 896 kg on the Sun. How many times more is that? **28**
- The area of Prince Edward Island is approximately 5657 km^2 . The area of Newfoundland is about 71.5 times that of Prince Edward Island. What is the approximate area of Newfoundland? **~~404~~ 475.5 km² or about 404 500 km²**
- A pair of ice skates was advertised at 20% off the regular price. The regular price was \$31.95.
 - What is the amount the skates have been reduced? **\$6.39**
 - What is the sale price of the skates? **\$25.56**
- A city newspaper costs \$0.25 a day on Monday through Thursday and \$0.50 a day on Friday and Saturday. How much does the paper cost for four weeks? **\$8.00**
- In its first 5 softball games, the school team scored 9, 5, 12, 3, and 6 runs. The team won 4 games and lost only 1. What was the average number of runs scored per game? **7**
- The Grade Six class of King Richard School collected 1148 bottle tops for an art project. There were 28 students in the class. How many bottle tops did each student have? **41**

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